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P14

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A

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DUREX ABRASIVES LTD wish to announce that as from June 14th, 1951, the name of the Company has been changed and is now the MINNESOTA MINING & MANUFACTURING COMPANY LTD.

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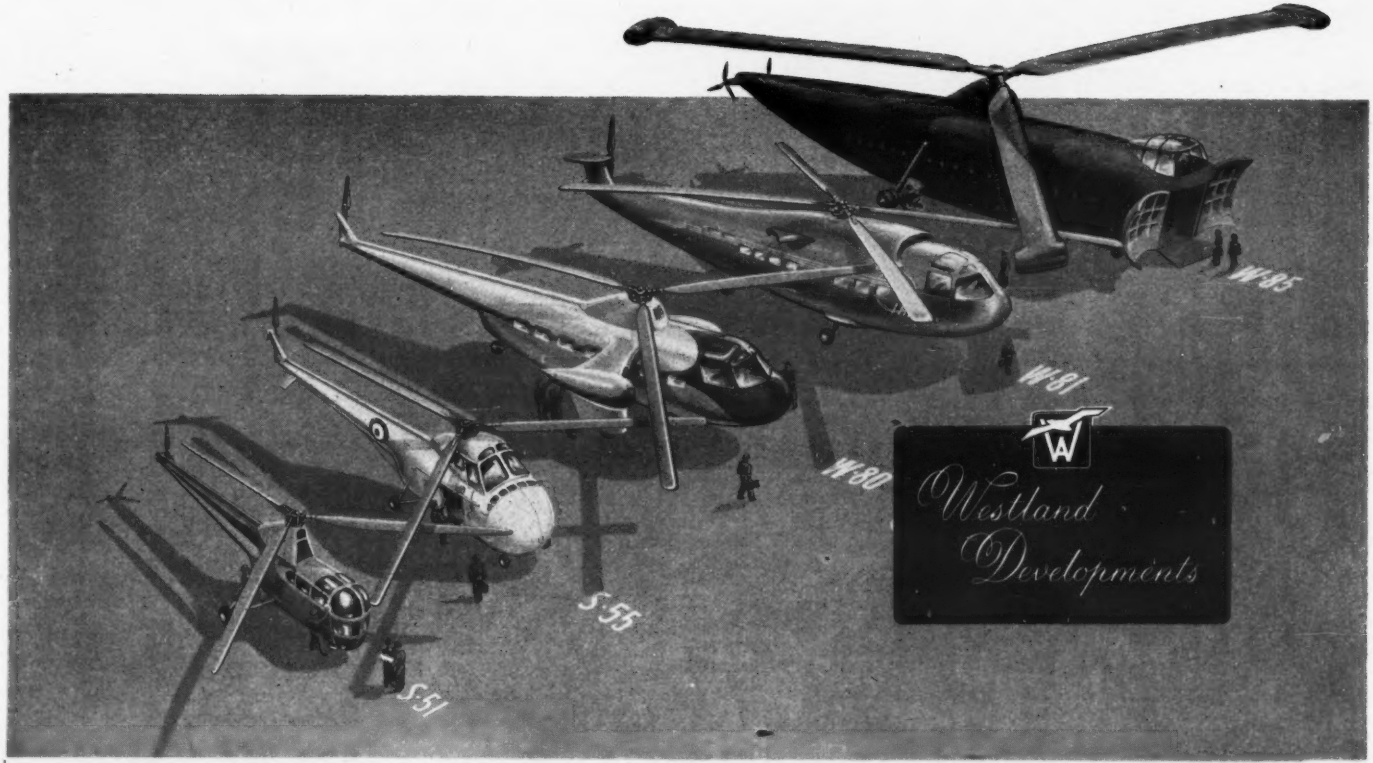

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Mr. Nye Bevan and Micky Foot, known to his friends as "Mi", have told us that the British Press (except of course the TRIBUNE — if that is its name) is the tool of capitalist advertisers. So you will suspect that we secured the following fine write up simply by paying a sum of money to this publication. And you will be right!

• • •

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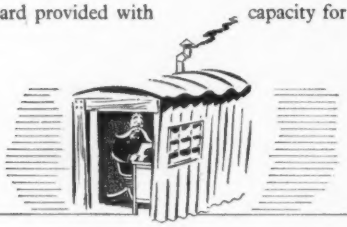
Increasing world wide demand for the famous Desoutter Small Power Tools is the explanation of large scale extensions to the famous Desoutter Works at Hendon. A small rug has been purchased for the famous Managing Director's office and a cupboard provided with capacity for no less



than six famous glasses and twelve infamous bottles. Long corridors now extend in all directions and a great air of importance is created by crowds of excited employees rushing rapidly in all directions trying to locate Incoming Orders, Typists Pool, Progress Upwards, Foreign Despatch or just the Usual Offices. The Stationery and Advertising Department is now handsomely housed under the stairs, while the brain of the whole vast enterprise — Design and Research — has been fitted with barred windows and a swinging trapeze.

Our representative was privileged to follow an Incoming Order down several corridors and on to various ingenious charts and graphs until it finally disappeared into a heap on the Sales Manager's new steel Incoming Orders Tray.

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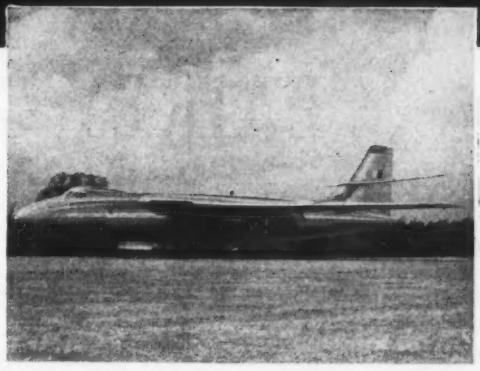

Vickers-Armstrongs again lead the way —with the Valiant bomber, powered by four Rolls-Royce Avons. A substantial order has been placed on behalf of the Royal Air Force for the Valiant which made its first flight on May 18th, 1951.

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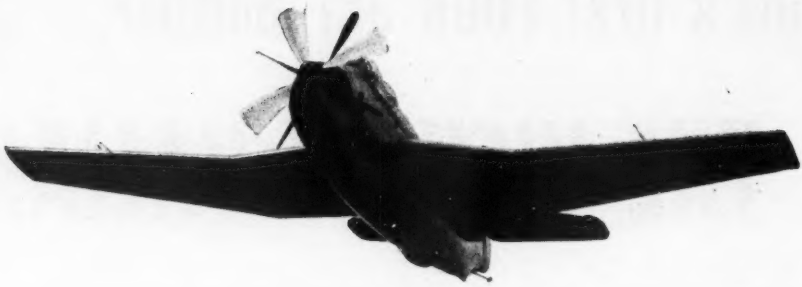
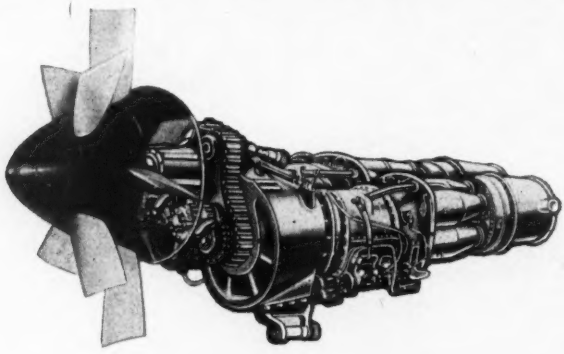


'SINGLE DRAG'

The design benefits of a single engine formula



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First Aeronautical Weekly in the World

Founded 1909

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The Club is Fifty

ONE of those great national sporting clubs which are essentially British institutions, having few counterparts anywhere else in the world, celebrates its jubilee on Monday next, for it was fifty years ago—on October 29th, 1901—that the Royal Aero Club officially came into being. Precise dates of this sort are difficult to establish, and some might argue that the true conception was on September 24th, when Miss Vera Hedges Butler gave expression to her idea that a club for aeronauts should be formed. At the time, with her father and the Hon. C. S. Rolls, she was a passenger in a balloon being piloted over Kent by Stanley Spencer. Her proposal was acted upon as soon as the party landed, and a month later the club was registered. Familiar as these details may now be, it is both pleasant and appropriate to recall them at this time.

Although almost everything aeronautical is to a greater or lesser extent the concern of the Club, its particular interest today lies in the field of recreational and sporting aviation —private flying, competition, records and air touring. In this connection its founder-membership of the Fédération Aéronautique Internationale—the international controlling body formed in 1905—may be mentioned.

With pride we recall that early in 1909 *Flight* became the official organ of the Aero Club, the committee signifying its acceptance of the proposal on January 5th of that year. On the first page of *Flight* to carry the title "Aero Club of the United Kingdom," the late Harold Perrin, the secretary, announced that "the official organ entitled *Flight* will be sent weekly to the Club members free of charge." The Club notices which followed included a list of some thirty new members, one being H. Gordon Selfridge.

Royal recognition for the Aero Club came during its tenth year, King Edward VII signifying his pleasure that this privilege be granted on February 15th, 1910. Royal patronage followed in 1936. Since then the Club has been honoured on many of its occasions by the presence of members of our air-minded Royal Family, and it is, of course, the body which organizes the air race for the King's Cup, first presented by King George V in 1922.

Though last Wednesday's R.Ae.C. Jubilee Ball took place after these words had gone to press, we have no hesitation in saying that its success was assured by H.R.H. Princess Margaret's graciously signifying her intention of being present. On this occasion, too, it was hoped that the Princess would accept a copy of the Jubilee Book of the Royal Aero Club, just published, and entitled *Fellowship of the Air*. In it are recorded the Club's struggles and achievements, and a rich store of personal anecdotes of the incidents —some important, some seemingly trivial—upon which traditions of peaceful flying have been founded.

Lethargic Urgency

AT Farnborough time one of the things people tried to forget was that the majority of the new military aircraft were still prototypes with, at best, a production order, but no production line, to back them. It was encouraging, nevertheless, to have prototypes of the kind and quality to merit immediate production.

By the time these words are being read the result of the election will be known and one or other party will have to undertake at once the huge responsibility of administering our almost overwhelming rearmament programme. That to date the aircraft industry is far from getting into its stride is apparent, and there have been few signs elsewhere of that sense of urgency which alone may prevent the programme from getting far behindhand. There has been much talk but little readiness to grapple with the real problems.

Americans suggest that in our industry, research and development still have too much priority over production. More to the point, they draw attention to the size of our labour force, and the five-day working week compared with the six-day week now generally accepted in America. It will be only as a result of almost superhuman efforts that man-power, machine-tool and material problems will be overcome and our programme completed. Moreover, we shall need all the help that allies—particularly our friends on the Continent—can offer by manufacturing components and sub-components for us.

"FLIGHT" PHOTOGRAPHS

Tac/R squadron pilots operate in pairs, and close examination of this photograph will reveal that two Meteors were taking off here.

HIGH-SPEED SPIES

No. 2 Squadron, Second T.A.F., Aid "Southland" in Exercise "Surprise Packet"

ON Monday last week we motored through the mist down to Thorney Island to have a brief session with No. 2 Squadron who, with their Meteor F.R.9s, had come over from 2nd T.A.F. to give a hand to the defending "Southland" forces in the Army's large-scale exercise, "Surprise Packet."

As the day wore on the sun burnt away the mist down on the coast, and the squadron were able to get aircraft off: inland, however, the weather was still very thick in places and this resulted in some negative reports when the pilots returned and were de-briefed.

The first R.A.F. unit to be equipped with Meteor F.R.9s, No. 2 Squadron, are based in Germany, their rôle being tactical reconnaissance. For this duty the normal operational method is for aircraft to operate in pairs, the leader doing the actual recce. duty, whilst his companion keeps a-weather eye lifting to prevent their being jumped by enemy fighters. An apparently simple method, such work is, in fact, not without hazard; it demands an unusually high degree of piloting skill, recognition qualities which the most enthusiastic "spotter" might justifiably envy, and a high standard of navigation. To take these prerequisites in the order given, the pilot must be capable and thoroughly at home in flying fast at "nought feet." Most people who have flown an aircraft have occasionally (and usually illegally) gone hedge-hopping, and a blood-tingling, rather desperately exciting game it is; but to do it as a normal job in a Meteor is something very different—is, in fact, rather akin to Grand Prix racing by comparison with ordinary motoring.

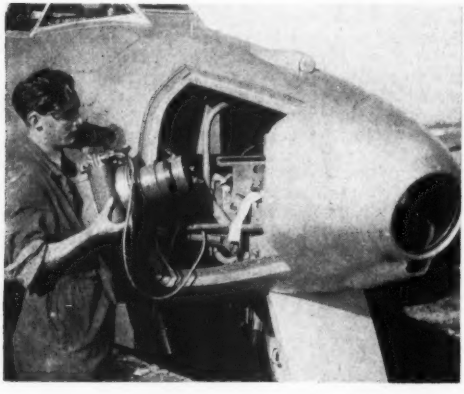
Whilst flying like this, the pilot has also to note what is going on on the ground. Of necessity he can spare not much more than a fleeting glance and, therefore, his ability instantaneously to recognize pieces of enemy equipment—guns, tanks, special-purpose vehicles, etc.—for what they are, is fundamental to the job. He must, in addition, be more than a "spotter" as such; he must be familiar with army formations and methods in order to give full value to what he sees. Finally, he must navigate. To some extent he is aided in this by the use of a large-scale map, but, even so, the difficulties of finding one's way about by contact navigation are more or less inversely proportional to the altitude at which one is flying.

S/L. R. M. Pugh, A.F.C., commanding officer, No. 2 Squadron.

The look-out man of the pair has, perhaps, a slightly easier task, but not by much. He flies a little way behind the leader and has to hold him in sight whilst keeping a watchful scan of the sky above, ahead, abeam and behind. With the leader weaving about and, perhaps, in conditions of haze, this is no sinecure. There is little doubt that, all things considered, the duty of tactical reconnaissance is among the more "dicey" operational jobs in Service flying and, by the same token, the pilots of No. 2 Squadron are collectively of above average ability.

From the foregoing it may be wondered why the squadron is equipped with Meteor F.R.9s which, of course, are basically F. 8s modified to house a camera in the nose. Certainly Tac/R work is primarily a visual task, but if the pilot cannot, for some reason such as camouflage, odd shadows, or, perhaps, enemy fire, clearly see (or hang about to make certain of) something which has engaged his attention, he can take a quick camera shot or two. On his return to base, the film will be printed rapidly and the picture can then be studied, perhaps stereoscopically, without the viewer being distracted by enemy attention.

The camera emplacement in the nose of the F.R.9 Meteor permits the camera to be directed abeam to port, to starboard, or ahead.



The camera installation in the F.R.9 is neatly arranged, a universal mounting rack providing anchorage for a camera directed to port, to starboard or ahead. The mounting is such that the camera may be levelled horizontally or depressed to any angle up to 14 deg; in this context the usual setting is 12 deg depression. An F.24 camera is used, mostly with an 8in lens but, sometimes, with a 14in alternative. The exposure windows in the fuselage nose are approximately a square foot each in area port and starboard, and about 9in diameter in front. Actuation of the camera is governed by a positive-action switch near the pilot's power lever. We asked the squadron C.O., S/L. R. M. Pugh, A.F.C., why the switch was not placed on the control column, and were told that it was preferable to have it where it is, as the pilot's left hand was free and was usually kept on the power lever anyway, whilst his right hand was gripping not only the control column but a map as well.

S/L. Pugh, who has been C.O. of No. 2 Squadron for about a year, brought 12 of the squadron's aircraft over to Thorney, together with 22 pilots and 86 ground staff. Although dependent upon Thorney for parent facilities such as messing and so forth, the unit was otherwise self-contained. The ops room was arranged

As No. 2 Squadron is based in Germany, emergency instructions on the sides of the aircraft are duplicated both in English and German

Pilots and aircraft, dispersed in the sunshine, await their turn to get off for a spot of low-level espionage over the "Fantastic" ground forces.

on the ground floor of the control tower, and the crew room, etc., at dispersal. This system was, of course, a function of the facilities available at the airfield, but it appeared to be working very well. Two leader-and-lookout pairs were always maintained in the ops room, and as soon as one pair were sent off on a job they were replaced by another pair from dispersal, a transport shuttle-service being laid on for the purpose.

The highly specialized nature of the squadron's work demands a rather different organization than that which normally applies. They have no Wing Commander Flying and do their own operational controlling; for this reason the squadron has the unusual complement of five flight lieutenants who, on a roster system, act as ops controllers with the C.O. keeping a watching brief and, as necessary, taking his turn at the table. Attached to No. 2 (and to their companion photo-reconnaissance squadron, No. 541, also based in Germany) are two army officers, Maj. Newton and Capt. Wilson, who head the Ground Liaison Section. By this means, the squadron is kept informed about army affairs, methods of work, equipment and, in fact, everything which has any conceivable bearing on the job. Maj. Newton and Capt. Wilson accompanied the squadron to Thorney Island and were responsible for briefing and de-briefing the pilots.

Although the squadron were operating in their normal Tac/R rôle on behalf of "Southland," the defending side, they were, in addition, available on demand for laying on ground attack sorties as well, chiefly in order to give the ground forces some experience of what it was like to have jet aircraft flashing about low overhead. The ground-attack sorties, however, were relatively sporadic and afforded occasional light relief for the pilots as a change from their more normal and, perhaps, more hazardous work. The area of the exercise was bounded by a line running roughly from Wareham, *via* Wimborne, Ringwood, Romsey, Winchester, Alton, Farnham, Aldershot, Camberley, Maidenhead, Marlow, Watlington, Wallingford, Didcot, Swindon, Wootton Bassett, Chippenham, Corsham, Bradford-on-Avon, Frome, Maiden Bradley, Mere, Wincanton, Sherborne, Dorchester, Wool, Lulworth, and back to Wareham.

This area was outlined on two large (half-inch to the mile) maps on the wall of the ops room, each covered with tracing linen on which chinagraph symbols were appropriately marked. One map showed the ground situation and was used for briefing, whilst the other showed the missions in progress. As a yardstick to guide pilots as to what was "report-worthy" *for the exercise* was the list: four tanks, eight vehicles, 30 men, bridging equipment, four guns, H.Q.s, parachutes.

Back in the ops room, after a mission, a pair of pilots are de-briefed by Captain Wilson, a ground liaison officer attached to the squadron.

The normal operational procedure was for the squadron to be given an overnight "pre-plan" for their first-light reconnaissance the following morning, these first-light missions being to make area-or-road searches to establish any change in the overnight *status quo*. Thereafter, during the day, the squadron's missions would be impromptu on (army) demand. The squadron were given six check points, or "gates," respectively at Romsey, Winchester, New Alresford, Alton, Farnham and Camberley, over which they were required to pass into and out of the exercise area. Army headquarters, on being advised of the time the aircraft would be passing over the check point, would then instruct the appropriate defending gunners to give the aircraft a safety lane between check point and search area. For the flight back from the search area to the check point, a similar safety lane was arranged, the pilot telling Army H.Q. that he would be leaving his search area in, say, five minutes, whereupon H.Q. would accordingly instruct the relevant guns.

In conclusion, it remains only to be said that No. 2 Squadron is evidently a highly efficient unit in which that curiously indeterminate and yet potent quality, squadron spirit, is a very real thing. The pilots like the F.R.9 very well as, in fact, do the ground crews, for the serviceability and maintenance factor for these aircraft is excellent. As to the amount of flying the squadron put in, this averages about 360 hours per month, and in this context it is apposite to recall that the squadron this year won the Duncan Trophy for the R.A.F. day fighter squadron achieving the best all-weather flying record.

CIVIL JOBS FOR EX-N.S. PILOTS

AN announcement by the Ministry of Civil Aviation of steps taken to encourage R.A.F. National Service pilots to seek posts in commercial aviation at the conclusion of their service indicates a move in the right direction and one foreshadowed in a leading article on September 28th.

The statement says that by arrangement with the Air Ministry the National Serviceman who has attained "wings" standard may apply to appear before a selection board on which prospective employers will be represented. If a candidate is approved by the board he will be considered suitable for civil aviation and eligible for any vacancy existing at the time of his release. The new arrangements will augment the current pre-selection scheme applicable to R.N. and R.A.F. personnel.

The flying experience which a National Serviceman will acquire in the R.A.F., says the announcement, will be sufficient to meet the requirements of the civil Commercial Pilot's Licence, and it will be possible for him during his Service training to obtain the additional knowledge of civil aviation required to pass the examination for such a licence.

The qualifications usually required by a civil transport pilot, however, are at least those of the next higher licence, viz., the Senior Commercial Pilot's Licence. The Minister of Civil Aviation therefore expresses his confidence "that employers will be willing to engage ex-National Servicemen who have qualified for the Commercial Pilot's Licence and, under special arrangements, to train them on the job to the higher standard." The Corporations have already agreed to do so and to pay trainees at "cadet" rates.

On the face of it, the new move is less forceful than might have been hoped; but at least establishes the basic machinery.

FROM ALL QUARTERS

ROYAL COMMAND: Her acceptance of an invitation to the R.Ae.C. Jubilee Ball makes topical this happily informal picture of H.R.H. Princess Margaret in the cockpit of the Comet; the photograph was taken at a classic (though this year unlucky) R.Ae.C. event, the National Air Races. With the Princess are seen Sir Geoffrey de Havilland and Mr. John Cunningham.

The Egyptian Emergency

APART from patrol activity by Vampires and other fighters, and valuable service by Hastings in flying-in troops from Cyprus, much of the emergency duty occasioned by the trouble in Egypt at first fell to the lot of the R.A.F. Police. Men of the 3rd Police Wing are reported to have made constant patrols in Ismaila and elsewhere and to have assisted in rehabilitating families deprived of their homes by the mobs. Radio-equipped vehicles proved particularly valuable in maintaining communications in the danger areas.

On Thursday came news that Hastings transports were standing by to move 3,000 men of the 19th Infantry Brigade from Britain to Egypt. Several hundred R.A.F. Regiment personnel had been flown out on Sunday.

Navigational Honour

ONE of the most experienced senior pilots of the B.O.A.C., Capt. A. C. Loraine, F.R.G.S., A.R.Ae.S., F.R.Met.S., Superintendent (Atlantic), No. 3 Line, has been accorded the signal honour of a fellowship of the Institute of Navigation.

The award is in recognition of a flying career in which, by its nature, the application and development of navigational techniques has played an unusually important part. Capt. Loraine, who is now 41 years of age, joined Imperial Airways in 1932. Transferred to the Atlantic route in 1939, he conducted flight-refuelling tests; made, in 1940, proving flights for the U.K.-West Africa flying boat route designed as a substitute for the Mediterranean route; and inaugurated, in 1941, the B.O.A.C. Boeing 314 Atlantic flights. He was co-pilot on Mr. Winston Churchill's three Atlantic flights in 1942. The holder of Master Pilot's Certificate No. 1 for landplanes and flying-boats, he has flown over 13,000 hours.

Capt. Loraine's fellowship was announced at the annual meeting of the Institution (reference to which is made on page 530) held in London last Friday. The meeting was followed by a reception at Londonderry House, at which 120 guests were present, including Air Chief Marshal Sir Frederick Bowhill (Chief Aeronautical Adviser, M.C.A.), Sir Arnold Overton (Permanent Secretary, M.C.A.) and the Vice-Chief of Naval Staff, Vice-Admiral Guy Grantham.

American Sapphires

FROM the Martin Company of Baltimore it is learned that their twin-jet B-57A Canberras will be powered with two Sapphires, the American designation of which is to be J-65-W-1. These turbojets are, of course being built by the Wright Aeronautical Corporation. The thrust rating is 7,200 lb, and while the internal design is essentially the same as that of the original engine, accessory arrangements will differ considerably in order to conform to U.S. standards. Other news of B-57A developments is on p. 531.

R.C.A.F.'s First CF-100

ON the occasion of a ceremonial handing-over at Malton, Ontario, of the first Avro Canada CF-100 to the Royal Canadian Air Force, the Minister of Defence Production, the Rt. Hon. C. D. Howe, said that the aircraft was a notable Canadian achievement and a milestone in the country's industrial advancement, for it was the first to be completely designed, developed and produced in Canada; moreover, the Orenda axial turbojets were the first engines to be designed, developed and produced in Canada. It will be a few months yet before quantity production is achieved, but the CF-100 was the first of the modern all-weather long-range fighters to go into production.

Mentioning some of the features of the CF-100, Mr. Howe said: "Since it has an unusually short take-off run for its type, it can be put into service at most of Canada's existing airfields with resulting savings in airstrip construction costs." Alerted for action and fully armed, the CF-100 would climb from a sea-level airfield to its operating level above 40,000ft in less than ten minutes. It would be directed to its objective by means of the latest radar aids, and for long-distance patrol duties would be equipped with navigational aids in addition to the radar. With its high speed and high fire-power the CF-100 could be relied upon to carry out with distinction its appointed defence role.

Mr. Howe regretted the retirement, because of ill-health, of Mr. Walter Deisher, but congratulated the Avro Canada management in having obtained the services of Mr. Crawford Gordon, Jr., as the new president of the company.

Four CF-100 night and all-weather fighters have now flown, and several others are almost ready for delivery. The original prototype is being retained by Avro Canada for gunnery trials, and the first example to be powered with Orenda turbojets is being kept by the company as a flying test-bed for the power plant. A-V.M. Douglas M. Smith, Air Member for Technical Services, has stated that the radar equipment of the CF-100 costs a good deal more than did a complete Spitfire in the last war.

Americans Fly French Prototypes

PILOTS of the U.S.A.F., including Major Charles E. Yeager, the first man to exceed sonic speed, have been testing French military prototypes, including the S.O. Espadon and the Dassault Mystère. According to reports from Paris, the Mystère proved superior to an F-86 in a high-altitude mock combat, though the Sabre put up a better low altitude performance. Both machines were in the hands of American pilots. It is further reported that on a recent test the Mystère flew at 657 m.p.h.—some 14 m.p.h. slower than the Sabre's record figure.

"At Home" at Cambridge

THE proverbial good time was had by all at Cambridge on Saturday, October 20th, when No. 5 Reserve Centre was "at home" to members' families and friends. It was the second such occasion this year, and was again an opportunity for the Cambridge University Air Squadron to meet No. 22 Reserve Flying School in a varied competitive programme. The Varsity Flight, comprising ex-members of C.U.A.S. now flying with 22 R.F.S., made a third, very worthy, entry.

Interest in the usual formation contest was heightened by pilots' names being chosen from the hat only 30 minutes before take-off. While this lack of practice obviously resulted in a lower standard of station-keeping, it gave the U.A.S. pilots a better chance against their ex-Service brethren of 22 R.F.S. In rough-air conditions, however, experience told and the Reservists (P/O. Leighton-White, F/O. Howes, F/O. Ward) were winners.

A Meteor 8, resplendent in the black and yellow chequerboards of 63 Squadron, arrived in characteristic manner for an aerobatic five minutes. F/L. Beeching seemed to specialize in prolonged yet steepening inverted climbs, and we were suitably impressed by his ability to take what was obviously a large amount of negative g.

It is inevitable that these "at homes" bear a basic similarity, but the organizing committee did succeed in laying-on a number of unusual events. F/L J. Stearn, A.F.C., "won" the slow-flying race for the Varsity Flight, in which we witnessed the distressing spectacle of three Chipmunks "hanging on their props" and dropping wings here and there—all this at about 200ft.

Aerobatics-by-request was enlivened by a young visitor demanding two climbing rolls. The C.F.I., F/L. G. Hubbard, complied; and, as the commentator rightly remarked, this was "no mean feat in a Chipmunk."

A somewhat aged Vampire 1 was demonstrated by the chief instructor, S/L. L. V. E. Worsdell, D.F.C., who had earlier led F/L.s Hubbard and Stearn in what was probably the first display by Chipmunks of tied-together aerobatics. These officers, incidentally, were all instructing at Marshall's before the war.

The flying programme concluded with a traditional spot-landing competition—won in a deceptively lessening wind by the Reserve School. This set the seal to a clear win by No. 22 R.F.S. with 171 points. C.U.A.S. and the Varsity Flight scored 83 and 58 respectively.

The awards were presented by Air Vice-Marshal W. J. Seward, C.B., C.B.E., A.O.C., no 61(E) Group, R.A.F.

Camouflage—Aural and Visual

A FEATURE of Operation "Autumn Leaf," the largest Swedish manœuvres since the war, was the use of low-flying attack aircraft to cover the sound of approaching tanks—a technique, incidentally, once employed by the R.A.F. to blanket the sound of motor boats used in early Commando reconnaissances of the French Coast.

Pilots reported that few vehicles were seen on the Swedish roads, while the masking of infantry and artillery positions by means of "transplanted" trees, grass and moss made exact observation a highly difficult task. A new plastic uniform, with yellow spots, was tried out and is said to have rendered the soldiers almost invisible among the autumn colours of fields and trees.

R.A.F. Reserves Club Premises Secured

THE third—and, in our opinion, the best yet—annual dinner of the R.A.F. Reserves Club took place at the Criterion Restaurant, Piccadilly, last Friday. Without changing in any way the informal atmosphere of the occasion, the much-appreciated presence of the Chief of the Air Staff and two other members of the Air Council added greatly to the occasion. The president, Air Chief Marshal Sir Guy Garrod, spoke of the rapidly maturing plans for Club premises. Sufficient money has now been raised to permit the contract to be signed, although more money is still needed to add to the £7,500 gift approved by the Air Council from the central (non-public) fund; the £5,000 20-year loan from the same source; a sum of £1,200 in prize money; a very creditable total of £4,000 raised by the members; and the aircraft industry's contribution of £44 16s. No. 14, South Street, Park Lane, W.1, will open its doors as the R.A.F. Reserves Club early next year.

At the dinner "The Club" was proposed by Mr. C. G. Grey, who pleased guests with his reminiscences and made spirited comments regarding the publicity (or lack of it) given to recruiting for the Services and Reserves. Sir Archibald McIndoe replied, and afterwards the Chief of the Air Staff, Marshal of the R.A.F. Sir John Slessor, took the opportunity to express the thanks of the R.A.F. to all the Reserves who had unselfishly co-operated and done such good work during their special call-up periods. He mentioned the Auxiliaries, who had given three months of their time, and in particular those qualified flying instructors in the V.R. who had responded to the 18-month call-up. Pictures at the dinner appear on page 551.

TALKING ENGINES: Pratt and Whitney's Mr. W. P. Gwinn greets Mr. W. T. Gill, Rolls-Royce director and S.B.A.C. president (centre), and Mr. W. R. Verdon Smith, Bristol joint managing director (second from right), on their arrival at the United Aircraft Corporation's Reutschler Airport, East Hartford, Connecticut, on October 11th. Another British visitor was A. Cdre. A. W. B. McDonald, C.B., C.B.E. (right), officer commanding the A. and A.E.E., Boscombe Down. The visit was part of the tour to which detailed reference was made on page 500 of the previous issue. Admiral De Witt C. Ramsay, president of the A.I.A. (left) was acting as "general" host.

MARKING THE R.Ae.C. JUBILEE

IN the leading article in this issue, referring to the jubilee of the Royal Aero Club, mention is made of the book published specially to commemorate the occasion. For the benefit of any readers who may not have seen previous announcements, the title is "Fellowship of the Air," the author is B. J. Hurren, and the book has been published for the R.Ae.C. by Iliffe and Sons, Ltd., proprietors of "Flight." Finely bound, and printed in large, clear type, the 230 pages tell in absorbing fashion the story of the British private and sporting flying movement from 1901 onwards; over 80 photographs are included.

"Fellowship of the Air"—which, incidentally, would make an ideal Christmas gift for anyone interested in aviation—is available to the public as well as to R.Ae.C. members; the price is 30s.

A New Car Ferry

A FIVE-YEAR licence has been granted to Silver City Airways to operate a car ferry between Eastleigh Airport (Southampton) and Maupertuis Airport (Cherbourg) on similar lines to the service which has plied with outstanding success between Lympne and Le Touquet during the past three years. The new ferry will start next month, and the company estimates that during next year's holiday season it should carry about 2,000 vehicles. Freight will constitute a large proportion of the traffic this winter.

Solent for Aquila

AQUILA AIRWAYS have now acquired their first Short Solent, *Sydney*, a practically new 41-seater which has actually flown only one hour as a B.O.A.C. Solent and, previously, six hours as an R.A.F. Seaford. It is powered by four Hercules 637 engines. The machine has been given a complete C. of A. by Shorts and should be in service on the Southampton-Madeira run towards the middle of December. The company may purchase additional Solents to augment its present fleet of 12 Hythes.

Ceramics in Gas-turbine Construction

CERTAIN companies in France, perhaps following the early German lead, have continued to experiment with ceramics and what they describe as "mixed materials" for the replacement of alloys and steels in high-temperature sections of gas turbines. For example, S.N.E.C.M.A. have since 1947 maintained a ceramics section in their experimental laboratory, and among experiments carried out has been one with ceramic-lined exhaust pipes on a 12S piston engine. Prolonged tests, including operation in Equatorial Africa, are said to have produced convincing results.

A Generous Gesture

IT will be remembered that Mr. B. N. Wallis, the Vickers-Armstrongs aeronautical research and development chief who received £10,000 tax-free in recognition of his work on the Möhne dam weapon, generously passed on the award for use in educating the children of deceased, serving or former R.A.F. personnel.

It has now been announced that, with a similar sum contributed by the R.A.F. Benevolent Fund, the money will be used to found the "R.A.F. Foundationers' Trust," which will give scholarships for 15 boys and girls to Christ's Hospital at Horsham and Hereford. Mr. Wallis has stipulated that the scholarships will not be competitive, but will be based on the fathers' war records.

These details were given by W/C. J. B. Tait, a former commander of No. 617 Squadron of "dam-busting" fame, at a squadron reunion in London last week.

HERE AND THERE

Royal Visit to Canadair

ON the afternoon of October 30th their Royal Highnesses Princess Elizabeth and the Duke of Edinburgh will visit the Canadair plant at Montreal. They will meet the president and directors and will make a tour of No. 1 and No. 2 plants before inspecting a completed F-86 Sabre.

French Tay

THE first Rolls-Royce Tay turbojet to be built in France by the Hispano-Suiza company left the Colombes workshops recently, and it is now learned that it has passed its acceptance tests satisfactorily.

Rocket Acceleration

ACCORDING to Mr. Beale, Australian Minister for Supply, Britain has been pressing for a greatly accelerated programme of trials over the long-range rocket proving grounds at Woomera.

Turboprop Constitution ?

ASKED in an interview by our contemporary *American Aviation* whether the once-mooted idea of a turboprop version of the Lockheed Constitution was still alive, an executive of the company replied : "From Lockheed's standpoint it most certainly is. The Constitution was originally designed so that it could take turboprop power. It would make a crackerjack airplane with, for example, P. and W. T-34s." (The Constitution is a four-engined long-range naval transport of 189ft wing span.)

Stout Show

THE films which should have accompanied Mr. Ernest G. Stout's R.Ae.S.-I.Ae.S. Conference paper, *A Review of High-Speed Hydrodynamic Development*, were held up on entry to this country. They are now to be shown, under the auspices of the Royal Aeronautical Society, at the Institution of Civil Engineers, Great George Street, London, S.W.1, on November 1st, at 6 p.m. The programme lasts for approximately an hour, and tickets are obtainable through members of the Society. An abstract of Mr. Stout's paper appears on pages 542-544 of this issue.

CZECH HELICOPTER: Designed by Ing. J. Slechta, this experimental helicopter has flown successfully at Zbraslav on the power of a 75 h.p. Praga D engine.

Fairly Bristling

ACCORDING to *Saab Sonics*, a new weapon was seen for the first time at the Malmslätt air display. Fitted to a Saab 21R ground-attack jet fighter, it comprised "a streamlined nacelle mounting a great number of guns in addition to the standard armament.

Hubert Scott-Paine Here

IN Britain on a short visit, for the first time in 12 years, is Mr. Hubert Scott-Paine, pioneer flying-boat designer, airline operator and pilot and designer of high-speed marine craft. He was the designer of the Napier-engined Supermarine flying-boat with which, at Naples in 1922, Capt. H. C. Biard won the Schneider Trophy from the Italians. Mr. Scott-Paine, owner of the Supermarine Aviation Works in 1922-23, founded the British Power Company—famed for air-sea-rescue and other high-speed launches—in 1927. Latterly he has been living in America, and has been the victim of illness since 1947.

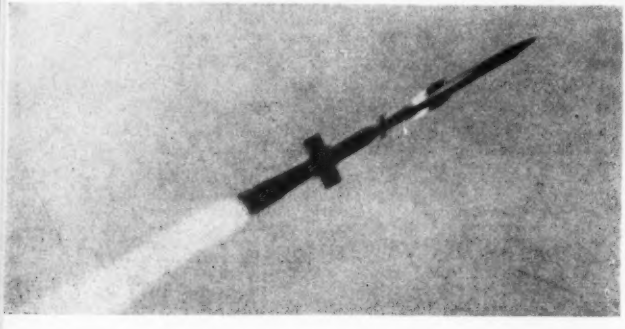
So Nice when You Stop

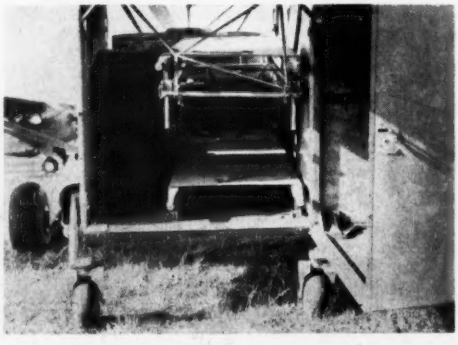
SENOR MACIEL, instructor of the Aero Club of Huinca Renanco, in Argentina, claims a "world record" of 1,090 consecutive loops, performed in a Piper PA-11 trainer.

Institute of Navigation A.G.M.

THAT H.R.H. the Duke of Edinburgh had accepted honorary membership was announced at the recent annual meeting of the Institute of Navigation. On the same occasion the year's work was reviewed, and it was mentioned that the activities of the technical committee had included an extensive study of the problem of optimum flight-paths, while preliminary work on map requirements for civil-aircraft operation had been undertaken with a view to an inquiry into the subject. Annual awards for 1951, also announced at the meeting, included the Institute's Gold Medal, to Mr. H. C. Pritchard, "for valuable contribu-

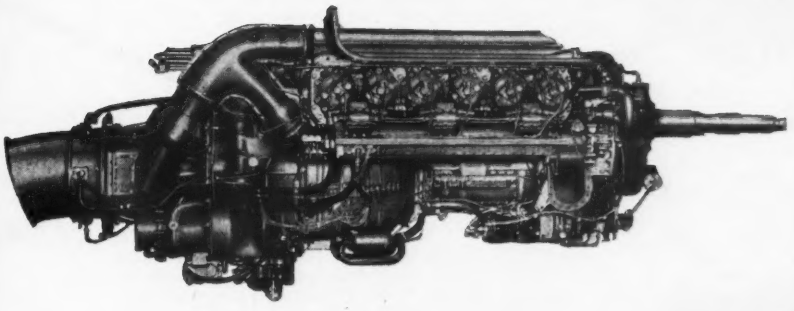
MISGUIDED MISSILE: According to a leading daily paper, this is a "guided missile larger than a V-2", and one that was "on the secret list" until the picture was "made officially available" to the paper last week. In fact, it is one of Britain's earliest supersonic research rockets which, even with its booster, was only 24ft long, whereas the V-2 measured 46ft.





ON MANOEUVRES : For participation in Exercise "Surprise Packet," in the area round Salisbury Plain, the Auster Ambulance/Freighter has been given a provisional camouflage finish (though it retains its civil registration letters) and the double-tier stretchers have been installed.

NAPIER



NOMAD

Nomad — the world's finest composite aircraft engine. Half diesel, half gas turbine, the Napier Nomad delivers 3000 h.p. to contra-rotating propellers with a specific fuel consumption unapproached in aviation. The Nomad is the latest manifestation of the engineering skill and practical originality of outlook which through more than fifty years have enabled Napiers to build outstandingly successful engines for air, land and water transport.

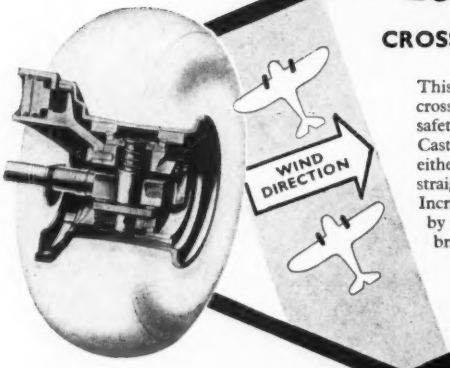
D. NAPIER & SON LIMITED, LONDON, W.3

SAFETY ON TOUCHDOWN

GOODYEAR

AIRCRAFT TYRES

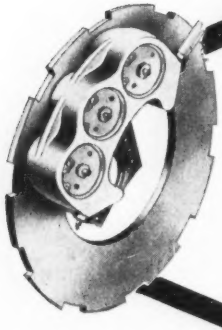
Developed through years of research and testing, Goodyear aircraft tyres are built to " take it " on touchdown. Resistant to heat, fatigue and bruising, built to stand up to the impact of weight multiplied by m.p.h., they assure safety at today's high landing speeds. The All-Weather Tread illustrated is one of the variety of aircraft tyres, designed to give maximum reliability under all conditions.



GOODYEAR

CROSS WIND LANDING GEAR

This patented Goodyear device permits cross-wind landings or take-offs in relative safety, without any tendency to ground loop. Castoring wheels permit a yaw of 25° on either side of centre while maintaining a straight course along the runway.
Increased flying safety is further enhanced by the incorporation of the popular disc brake in this revolutionary castoring wheel.



GOODYEAR

ORIGINAL DISC BRAKES

The Disc Brake was first introduced by Goodyear several years ago. Since then the knowledge gained from actual operating experience has been vigorously applied, and to-day, the Goodyear Disc Brake has a reliability unique in this field. They give the pilot real confidence in landing, and sensitive control in every ground manoeuvre. Here again, Goodyear Research and Enterprise are far in the lead.

YOU CAN TRUST
GOODYEAR
AVIATION PRODUCTS
FOR UTMOST RELIABILITY

HERE AND THERE . . . .

tions . . . over a number of years in the field of airborne navigation equipment." (In 1939 Mr. Pritchard formed the Navigation Section at the Royal Aircraft Establishment.) Among recipients of three Bronze Medals for papers contributed to the Institute's journal were Mr. C. S. Durst and Mr. N. E. Davis, for a paper on *Jet Streams and Their Importance to Air Navigation.*

Mountaineering

THE Piper Cub which, as we briefly recorded last week, was successfully landed on a snow slope near the peak of Mont Blanc, was later reported to have taken off with the aid of "a mechanism used for catapulting gliders"—probably the conventional rubber launching-rope.

Power for the Future

AN experimental small-scale electric power-station plant driven by a gas turbine is now under construction at the National Gas Turbine Establishment, Farnborough, and is expected to be completed at the end of 1952. The output is to be about 10,000 kW. Heat from the turbine efflux will be utilized for heating the building in which the plant is installed.

American Canberra Developments

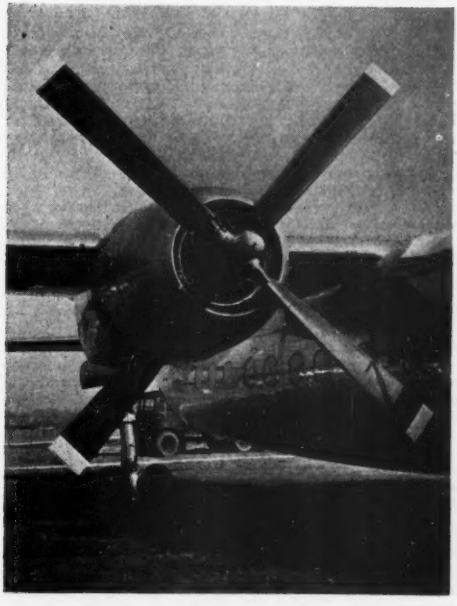
ONE of the latest steps towards Canberra (B-57A) production in the Martin plant was the inspection, by an official Board, of mock-ups of "new wing and cockpit installations." No details of these installations have been released, but it has been mentioned that among improvements suggested were metal, instead of canvas, handles for the ammunition boxes (confirming that the B-57A will carry guns), and a water container for the benefit of the crew on flights of "three hours' duration, or longer." Dive-brake modifications may also have been made.

Rotating-winged Pilots

A HELICOPTER which (as will be seen from the illustration) is suggestive of the "rocket men" currently popular in comic strips has been developed by Rotor-Craft Corporation of Glendale, California, for the U.S. Office of Naval Research. Weighing less than 100 lb, the machine consists of little more than a steel tube, a pilot's seat, a control column, a fuel tank and a two-bladed rotor carrying at its blade tips throttle-controlled liquid-fuel rockets fed from the tank. A little "weather-vane" rudder apparently takes care of rotor-torque reaction. It is said that the rockets emit no flame, so that the helicopters could be safely "worn" by troops making night landings. Other than that "Pinwheel" (the American term for "Catherine-wheel") is the name chosen, no further details have been released. It does appear, however, that the project is a serious one and that a number of promising ground tests have been made "at a military base near Los Angeles."

UMBRELICOPTER: Though æsthetically leaving something to be desired, this drawing of the "Pinwheel" helicopter (see adjacent column) gives some idea of the general appearance of the device. Probably intentionally, the rotor-tip rockets are not shown.

SHORTLY RETURNING from North America is Mr. Frank E. Buckell, A.F.R.Ae.S., A.F.I.Ae.S. (left), manager of the G.E.C. aeronautical department. He has been attending, in New York, the I.A.T.A. discussions on visual aids, and is now in Canada to discuss airfield lighting and also, at the Canadair (and possibly the Canadian Avro) factories, matters concerning aircraft electrical equipment.



THRUSTFUL: A de Havilland hollow-steel-blade airscrew under development on Britain's largest piston engine, the sleeve-valve Bristol Centaurus 630 of 2,450 h.p., as installed in the Airspeed Ambassador. A similar 16ft 6in diameter airscrew is used on the Bristol Proteus of 3,350 s.h.p. specified for the Bristol 175, or Britannia. The same mark of Proteus is employed in the outboard positions on the Saunders-Roe Princess, while counter-rotating versions of the airscrew are fitted to the coupled Proteus units of 6,700 s.h.p. which occupy the inboard positions on this ultra-large flying-boat.

IN BRIEF

THE British Institution of Radio Engineers has been honoured by H.R.H. the Duke of Edinburgh's acceptance of honorary membership.

* * *

Major-General C. A. L. Dunphie, C.B., C.B.E., D.S.O., has been appointed a director of Vickers-Armstrong Ltd.

* * *

It is announced that Sir Cecil Weir, K.B.E., M.C., has joined the board of directors of the Pyrene Co., Ltd.

* * *

The Ministry of Supply has given type-test approval to the Hymatic HC51 compressor for ancillary services in aircraft. Weighing only 10 lb, the compressor provides free air delivery of 1.5 cu ft/min when delivering against a pressure of 3,000 lb/sq in.

* * *

The B.O.A.C. service down the west coast of South America, between Kingston (Jamaica) and Santiago (Chile), *via* Peru, which was referred to in the recent article "Over Amazon and Andes", is not at present operating. Brazil is served from London by the B.O.A.C. route down the east coast of South America.

* * *

H. M. Hobson, Ltd., Fordhouses, Wolverhampton, announce that Mr. T. P. Searight has resigned his position as chairman but remains a director, while Mr. S. W. Hughes has been elected chairman and continues as managing director. Mr. T. Simpson becomes assistant managing director and Mr. P. H. Stokes has been appointed to the post of technical director.

does not show. Ironically enough, this time the very people who were lined up against us then are now at least sympathetically on our side, and the nation that was on our side last time is pushing trouble for us all over the world. It was against this insane background that our Government had to plan. How could we buy enough of the right weapons to protect us without bankrupting the country and destroying the very forms we are fighting to preserve? How could we get enough arms to protect us soon enough without invoking controls? And if we had controls, how could we avoid a life of scarcity? And if we had a life of scarcity, where would it all end? Finally, and most important of all, should we work out a national defence plan along the lines of "Fortress America," or "Troops for Europe," or "Asia First"?

"Not willing to act too quickly and not able to wait indefinitely for our planners, the nation nevertheless had to take positive action, and there emerged back in the autumn of 1950 the pattern of our air programme today. A middle ground prevailed. The architects of the plan proposed the authorization of a 70-group air force, patterned largely after the Troops-for-Europe plan, but with certain diversifying elements. The acceleration was to be moderate but unmistakably potent. It was, generally, to treble the rate of output in a little over two years; and it was to be done on a 40-hour week. Above all, it was to be laid on top of the output of civilian goods rather than taking precedence over it.

WHAT PRICE AIR POWER?

Some Facts and Figures on United States Air Rearmament, by Lockheed's President: A New Civil Aircraft and a New Concept of Flight

WE make no apologies for reproducing in these pages the greater portion of the address given by Robert E. Gross, before the American Bankers' Association in Chicago on October 2nd. Mr. Gross is president of the Lockheed Aircraft Corporation and is, therefore, a man whose public statements, especially on so serious a topic as air power, are not to be treated lightly. In the event, Mr. Gross's talk on this particular occasion was of outstanding interest, for it summarized brilliantly not only the present state and intentions of U.S. air power, but also explained lucidly the enormous differences between aircraft as they were in the last war and as they are today, and gave the background against which the present effort should be judged.

The heading picture shows F-84E Thunderjets on the assembly line at the Farmingdale plant of Republic Aviation. The factory is now turning over to swept-wing F-84F production. On the opposite page are seen "cocooned" B-29s at Davis-Monthan Field, Tucson.

"WHEN, in June last year, the 38th Parallel suddenly became world news, the American aviation industry was plodding along at a fairly steady rate of production—indifferent though the totals were. The monthly production of the entire industry, both for the Air Force and for the Navy, was only 200 or 300 aircraft per month. Suddenly the President called for an immediate increase in the number of planes to be built and also asked that the air industry be given make-ready contracts which could ultimately produce 50,000 planes per year. It was strongly reminiscent of that same clarion call that went out from President Roosevelt in the spring of 1940, when he, too, called for 50,000 planes and the industry confidently responded.

"This time industry was older, wiser, and it knew the pitfalls. Notwithstanding this, it took the government at its word and with the same determination it showed before. It started in all over again; soon, industry leaders were travelling to Washington for direction. A few orders were placed by the Government but, after some weeks, one thing became patently clear; industry could move faster and more positively than government. Finally, one thing shone through like a light: the call of 1940 was one thing, issued under clear, straightforward circumstances; the call of 1950 was something very different.

"In the first place, in 1940 the machines were clear-cut; we knew who our enemy was; there was no doubt about it. Germany was on the march in Europe and Japan soon attacked us from the east. The lines were formed quickly; everybody was friend or foe. There was no question of asking whether beef, gasoline had to be rationed. We were at war.

"Today all this is different. We are neither at war, full out, nor at peace, full out. We have some stout and declared allies who are ready to stand and to be counted. But the real enemy

"With the make-ready phase not quite over, we are already steepening the acceleration to equip a 95-group air force with mostly new planes in 1952. Our air force has already activated 87 groups, but this has been done only by using many old planes. This is a long way from the 243 groups we had in World War II, or the 96,000 planes the aircraft industry built in the one year, 1944.

"The next questions are obvious: what is this new air force costing, and why does it cost so much? Why all these billions for an air force less than half as big as that which we had in the last war? Well, as for cost, the currently proposed national budget calls for defence expenditure of around 56 billion dollars. About 20 billion of that will go to the air force. The air force in turn will spend more than 11 billion of its money on air equipment. The Navy will spend over four billion on aviation. Altogether, a total of 15¼ billion dollars on military procurement for air. Out of every defence dollar earmarked for military procurement 48 cents—almost half—is going to the aircraft industry.

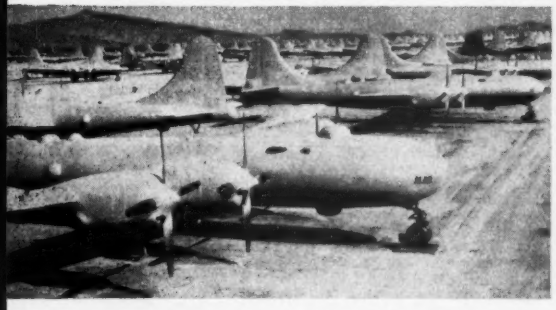
"Now the reasons aircraft cost so much more today than ever before are three: first, all our normal elements of cost are up; second, today's aircraft is different, it is heavier, faster and much more complex; third, we practically stopped building aircraft in 1945, 1946 and 1947.

"Ten or fifteen years ago the accent in design of a military aircraft was placed on the airframe, the engine and the propeller. They were the big three items and they represented close to 85-90 per cent of the aircraft. They also represented 85-90 per cent of the cost of the finished fighting weapon. Less than 10-15 per cent of money and effort was spent on the rest of the plane. A patrol bomber built early in World War II was loaded with 103 lb of instrumentation; but today's counterpart has 582 lb. A particular plane produced in

1944 carried almost 1,000 lb of electronic items; the comparable plane of today has well over 5,000 lb. Again, the nerve centre for the flight deck of a new Navy plane contains 12 miles of wiring. Performance is wonderful stuff—but performance costs money. You may be able to get a bargain out of buying a second-rate aircraft or a second-rate air force, but just try to get a bargain out of using one.

"In 1943, we figured that for a very specialized radar and electronic job, we could get along with one technician for every thousand employees. Today, we need one out of 24 to be such a technician. In 1943, one out of 22 was an engineering employee; today, one out of eight. Aside from the present-day elements such as labour and materials, no small part of the high cost of air power is traceable to the sins of the past. Our cost of aviation today is not high just because of the high cost of the things we are doing today but, instead, because of the things we *didn't* do in 1945, 1946 and 1947. That is the trouble with our air programme today—and it is the only absolutely basic thing that *is* the matter with it.

"An aircraft today epitomizes, I think, the longest, the most complicated and the most far-flung production effort of all time. I am speaking now about articles that we make in some respectable quantity production. A battleship is complicated and takes a long time—but we only make one or two. An aircraft is no longer just a frame, an engine and a propeller. The end-product that we call the aircraft is really



an assemblage of thousands of individual products, each of which has to be invented, developed, manufactured and then housed in the mother structure that itself has to be invented, developed, adapted, tooled and manufactured. This long and costly process represents a time cycle of five to seven years for the mother structure itself, to say nothing of the years of development of the various systems, accessories, and installations that make the whole an integrated thing.

"This is no small-time single-process show that can be stopped and started by the snap of a finger. This is the longest manufacturing river in the world. It has got to flow just so fast and just so far and pick up its feeders along the line, and in the end you've got the big water flowing out at the mouth of the river. But with the military victory in Europe, we shut off our airplane river right at the source. In the month of March, 1944, we produced over 9,100 military aircraft. Within a period of one month, from August to September, 1945, we dropped from 2,800 to less than 800. By the following summer (1946) America's powerful aviation industry was producing less than 100 a month—to be exact, 66.

"Several dry years went by. Then suddenly someone discovered that Russia had an air force. "Where had they got it?" everyone asked. This is how they got it—they just didn't ever stop building the one they had as we did. We let our stream run so dry that, in 1946 and 1947, it looked as though America wouldn't have even a small air force. However, a group of far-sighted men took note of the worsening world conditions in 1947 and began to urge immediate re-building of our air force. The President's Temporary Air Policy Commission, headed by Thomas Finletter, and the Hinshaw-Brewster Congressional Board, came up with virtually the same recommendation, namely, re-build aircraft production on a gradually intensified scale.

"So, in 1948, we began to turn the water back into the stream. But that shut-off in 1945 is now costing us the time and the big money. Here's the hard core of it: in 20 years, between World Wars I and II, we spent an average of less than 28 million dollars a year on aviation only to find that, to dig us out of World War II we had to spend 28 million dollars a *day*—and for more than four years. We spent an average of about 1½ billion a year in the years 1946, 1947 and 1948. Now, we are having to spend 15½ billion in just one year. And if conditions get worse, and they can, and if Senator Lodge's proposal for a 150-group air force were to be adopted, and it may have to be, it would call for 32 billion in fiscal 1952, 27 billion in fiscal 1953, and 37 billion in fiscal 1954. That is what the feast or famine—turkey one day and feathers the next—costs us."

Mr. Gross later referred to civil aircraft, guided missiles and an entirely new concept of flight. He said:—

"Volumes have been written as to what the next completely new great airliner will be. Several types are promising, but one that I feel sure must be built would be something like this: it would carry around 60 passengers in luxurious comfort, and have a cruising speed of around 600 m.p.h. It must have range and operating characteristics that will make it a magnificent airplane for the runs from Chicago to Los Angeles and New York. It must also have enough range to make it able to maintain dependable regularity of service in all weather both ways across the Atlantic with only one stop, and be able to make it non-stop except under certain conditions. Above all, it must demonstrate an improvement over present operating costs and maintain, if not improve, the excellent safety factors built into present-day airliners.

"Much has been said about the fact that Great Britain bids fair to seize the supremacy of airline air from our U.S. industry, because she is first in the field with the pure-jet airliner. How will you Americans like the prospect of seeing these planes digging into the business of your own airlines and air companies with the fruits of engineering man-hours and money that could just as well have gone in here at home? Actually this does not have to happen. With all credit to our British friends, whose courage and enterprise I am the first to salute, I say it is still not too late to keep the supremacy of the airline air as we always have. Again, with all due credit to them, I do not honestly believe that the British airliners have the range to make them practical for operation over ocean routes, and I do not think they have low enough operating costs to make them profitable over land routes. So the race is not yet over—or won."

Of guided missiles, Mr. Gross said that there were literally hundreds of different missile designs and types, but to date, the effectiveness of all kinds of missiles, as far as was known, was limited because they were of relatively short range. The long-range guidance system, not the missile, was the key. In plain language, a guidance system which could get beyond the horizon was necessary, and for that it was necessary to bend a beam around the curvature of the earth's surface. Mr. Gross said that he could not speak of it on that particular occasion, but did say that the U.S. had a fine start on the problem. When it was solved, it would be possible to put such a guidance system into something that resembled a fighter aircraft, power it with the same kind of engine now used in fighters, and shoot it off for its target.

Mr. Gross then went on to say that, given the development and encouragement of a permanent programme, and a little leisure, an entirely new concept of flight might be brought to fruition. Instead of dragging the wing or (helicopter) rotors through the air, by creating a pressure differential between the inside and outside of the wing, the air could be drawn *through* the wing, not the wing through the air. The wing could then stand still, rise vertically, and fly at high or low speed in any direction. It would probably have to embody the principles of boundary-layer control and have a ducted-fan engine which, in itself, would take 10-15 million (dollars) to work up.

As already stated, Mr. Robert E. Gross was addressing these words to the American Bankers' Association, and of this new concept of flying he said to his audience, "if any of you men have your cheque books on you, the line for this one forms on the right. When we get this plane, we'll call it the 'Little Dipper.'"

COMET VIEWS

Series I and II Progress: What Observers Abroad Are Saying : C.P.A.'s Plans

AS the weeks and months pass and the Comets continue to build up a substantial background of experience in the hands of both the manufacturers and the operators, it becomes apparent that the optimism about the capabilities of the aircraft and the earlier confidence in British technical skill to design and develop successfully the first jet airliner were both well justified. We do not doubt that the pioneer work on the operating side will prove to be in equally capable hands. It is, perhaps, the keen realization of the responsibility they bear which has led B.O.A.C. to be unusually sensitive to any criticism regarding their newest aircraft. In fact there have been few if any grounds for adverse criticism, and even competitive American opinion has been complimentary.

The de Havilland policy of restraint and of letting the Comet demonstrate its qualities rather than of trying to make good advance estimates is commendable; and this, indeed, is what has been going on during the past year—during which the Comet is understood to have given satisfaction and promise of being wholly up to its job on the first scheduled services to the East.

In this connection the recent valuable Commonwealth conference on jet airliner operation, while bringing out many of the requirements which will facilitate operations and increase efficiency nevertheless made it clear that no insurmountable problems are foreseen which would be likely to prevent the Comet from being introduced into service early next year with no more than the existing facilities and aids available.

The manufacturers now appear to be ready to say a little more about the Series II with Avon axial turbojets, and naturally enough it is this development which is now evoking more interest among most of the potential purchasers. The Ghost-powered Series I, though admitted to be still on the thirsty side, has ceased to be experimental and is described as a rugged, dependable aircraft with a particularly good record of serviceability. On the medium-range routes upon which B.O.A.C. and the French will operate it, the Series I is very much the answer to requirements. The Corporation is to take delivery of nine Series Is for a start. According to present plans these will be followed by five Series IIs. Already 400 Comet hours have been logged by Corporation pilots, and the total for the type is well over 1,000 hours.

One of B.O.A.C.'s own Comets is to be made available by the manufacturers on loan for crew training before the contract delivery date. The aircraft at present in use, which has been on loan to the Corporation from the Ministry of Supply since April, is shortly to be returned.

Canadian Pacific have decided that the two Comets which they have on order will handle services between Sydney and Honolulu. It seems that, although considerable stage-lengths are involved, weather is normally sufficiently good and reliable for the question of fuel reserves to be viewed in a light different from that necessary in other parts of the world. The plan is to introduce the Comets into service at the end of next year, and there should be very little delay after delivery, because C.P.A. will profit by B.O.A.C.'s proving and operating experience.

From the range point of view the Series I meets the requirements of a number of existing routes, while the Series II should suit most of the remainder, including the North Atlantic.

In this connection some views of Hall L. Hibbard, vice-president and chief engineer of the Lockheed Corporation, may be quoted. They were given in answer to questions put to him by our contemporary *American Aviation*. Regarding his company's proposed jet-transport design he said that, broadly speaking, the aircraft would be able to operate across the North Atlantic without refuelling. "We would expect always to fly non-stop eastbound. We also would expect to fly non-stop westbound except under the most severe weather conditions." He continued: "We could design a jet transport to non-stop the North Atlantic against such headwinds (150-200 m.p.h.), but it just wouldn't make sense."

Answering another question, Mr. Hibbard confirms the opinion that was held by forward-thinking people in this country several years ago. He said: "It is Lockheed's belief that all new *de luxe*-type passenger transport planes should be pure jet. The jet will provide the passenger with the most performance, the greatest speed and comfort. We would be able to give the operator an airplane which would have a lower seat-mile cost than the airplane he is operating today." Although this may not sound to be anything new, it is one of the first times that an important American designer or operator has made such a definite statement.

Mr. W. Strangman, speaking for the financial side of Douglas Aircraft and giving the Comet's lead as three to five years, laments that "competition with foreign-built transports constructed under government subsidies has hampered U.S. production of civilian jet types." He estimates the Labour Government's subsidy as about £143 million, and adds that the minute the American industry sees the possibilities of even limited production orders it will expand development. The president of Capital Airlines, Mr. J. H. Carmichael, states that it will be five to ten years before jet airliners are used by U.S. airlines. His reasons for "not sharing the optimistic view of jets which is so common today" are that they are only efficient at extreme heights; only a few routes are available today at such altitudes; and existing airports are not equipped to handle them. "Jets don't have the range and cannot be operated economically without 100 per cent subsidy," he adds.

It has been suggested that the Canberra gives a good idea of Series II Comet performance, because it has about the same wing loading and half the span and weight with two Avons. We get the impression that de Havillands prefer to regard the performance as unknown until the first Avon-Comet flies. It will be airframe number 6—the next in order to fly—and with luck should be the first important early-1952 event for the company.

The differences between military and civil turbojets are very much less than is the case between military and civil piston engines. We may quote Mr. Hibbard again here as saying: "Military jet engines now being developed will be eminently satisfactory (for jet commercial transports). In general you can say that any bomber engine will make a good transport engine." Even so, a good deal will remain to be learned about Avons when installed in the Comet.

In discussions with foreign and Commonwealth operators in particular, we have heard to an increasing extent the view that the present Comet is short of cubic capacity and that the long-range Series II would be even more attractive if it had a longer fuselage. Much earlier on, de Havillands mentioned the possibilities of an extended version. They have also indicated a possible 48-seat layout for the existing machine. We have no doubt that the makers of the Comet are alive to such possibilities.

It has also been suggested that for such a revolutionary advance in aircraft design something less conventional than B.O.A.C.'s interior layout (as shown on page 548) might have been preferable. This is obviously a matter which could be discussed almost *ad infinitum*, and it would still remain one of individual taste. There are definite limits to what can be done with 93ft of pressurized tube and there is much to be said for the adoption of a known-quantity layout in a strikingly new aircraft. The same line of thought prompts the initial testing of a new engine in a well-known airframe or vice versa. Perhaps some other Comet operator will in the future get the stylists to work on completely new interior planning, and public reaction to the alternative treatments can then be gauged.

It is true to say that with each month that passes the de Havilland Comet draws farther ahead in the field of commercial transports. We believe that its promise and future were never brighter, and we think that B.O.A.C. will have a tremendous advantage over other operators who continue to depend upon piston-engined transports.

The distinct possibility that, having sampled the speed and comfort associated with jet travel, the public will insist on nothing less may become a matter of acute embarrassment to the less progressive operator. As yet the Comet has no competitor.

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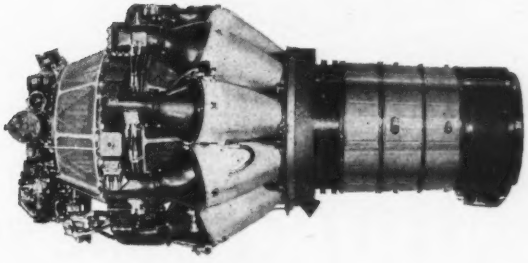

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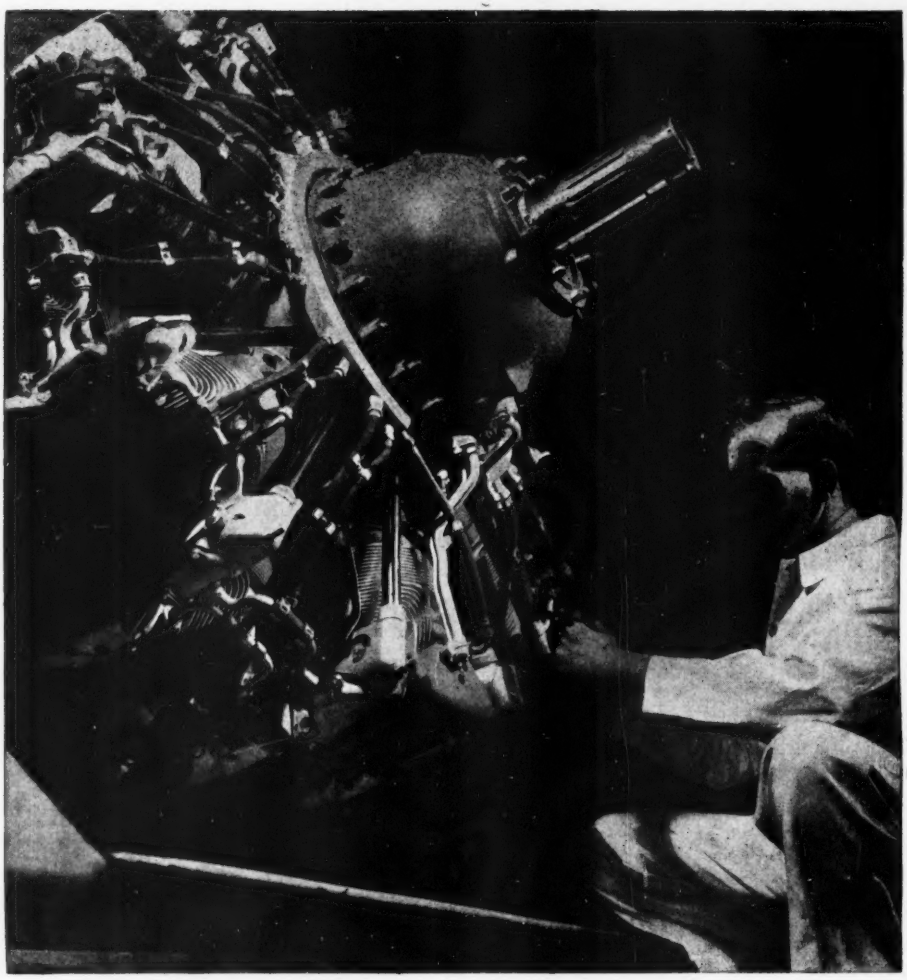

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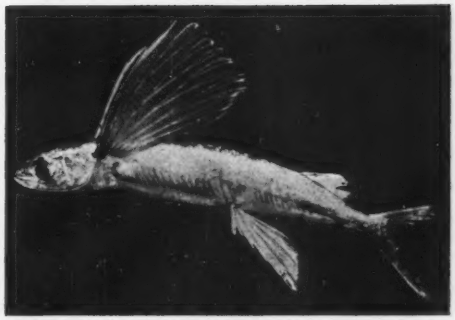
FLYING-FISH AERODYNAMICS

Further Notes on a Controversial Subject

By C. H. LATIMER-NEEDHAM,
M.Sc. (Eng.), F.R.Ae.S., M.S.A.E.



THOUGH not of direct aeronautical interest, a recent short article in these pages has aroused so much discussion that we consider this further contribution is well worth presentation, especially in view of the identity of its author. Mr. Latimer-Needham, who is chief engineer of Flight Refuelling, Ltd., and director of Luton Aircraft Ltd., is a light-aircraft and sailplane designer of long experience, and combines these interests with a keen insight into the phenomena of natural history.

CORRESPONDENCE has recently appeared in *Flight* under the heading "Can Fishes Fly?", the meaning given to the word "Fly" being flight under power and the means of propulsion being by flapping of the wings or, rather, pectoral fins. Several tentative theories concerning the phenomenon have been propounded from time to time, but they have been conflicting and often contradictory. Thus, the *British Museum Guide** states: "The question whether flying-fishes really fly, whether, that is to say, their pectoral fins are moved as organs of flight like the wings of birds and bats, is a subject of much contention."

Some writers have maintained that flight is accompanied by rapid beating of the fins, whilst others discount this with statements to the effect that the fins are quite still during flight. Others, again, contend that lift is obtained over the crest of each wave, that is by soaring flight, which, however, Hankin† finds unsatisfactory, as not being applicable in all

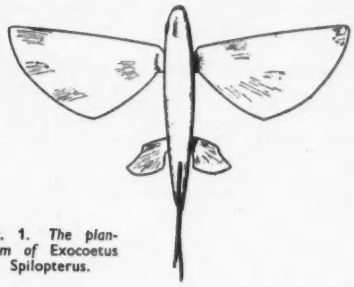


Fig. 1. *The plan-form of* Exocoetus Spilopterus.

cases. "The suggestion," he states, "that flying-fishes get energy by meeting upward currents at the top of each wave obviously does not explain a flight of half a mile over a smooth sea where there are no waves. . . . As a matter of fact and observation, flying-fishes may fly long distances along the trough of a wave or along the leeward side of a wave at high speed." Such a theory cannot, then, be accepted as the proper solution, although this is not to say that the duration of flight is never prolonged by the presence of rising currents.

Probably, the suggestion most nearly correct was put forward by Ahlborn, who believed that the flight was merely a prolonged glide with the incidence of the wings gradually increased to compensate for loss of speed until the final stalling back into the water.

Hankin discarded this also on the strength of observations which did not appear to disclose a gradual lowering of the tail. It should, however, be recognized that the rate of tail lowering would be much more noticeable towards the end of a flight, on account of the variation of lift with the *square* of the speed; and, furthermore, the initial speed is relatively high, which permits of a quite small angle of attack over the earlier part of a flight. Moreover, incidence can be increased by rotation of the pectoral fins whilst keeping the body horizontal, and it may well be that the tail lowering is done solely in order to get the tail fin into the water for control purposes.

Considerable evidence exists, apart from personal observation, to show that the tail is lowered prior to the descent (Jordan, Ahlborn, etc.) and this is confirmed by Hankin with such entries as: "Just before plunging, it *somewhat slowly* lowered its tail." (Italics not in original.)

Before proceeding farther, it might be as well to marshal the facts known about fish flight so that a proper perspective may be gained. There are several species of flying-fish which live for the most part in tropical or sub-tropical seas and rivers. The largest, of about 1 lb weight, is roughly 18in long, with a span of about 2ft and a wing loading of 2 lb or so per square foot.

The pectoral fins act as aerofoils and the pelvic fins as stabilizers. The fins are ribbed on the underside, no doubt for considerations of strength, the ribs running from the roots outward, or radially, and this would appear to be an adverse factor aerodynamically.

In considering the problem of flapping flight, Hankin‡ states that: "The weight of the flying-fish is about eight times as great as that of a bird of similar size . . . [but] the muscles for moving the wings . . . are at least five times smaller than those of a bird, according to measurements given by Moebius." The muscles attached to the pectoral fins are more developed than those of fish incapable of flight, but it seems fairly certain that they are insufficiently powerful for flight purposes, except perhaps as an auxiliary means of providing thrust. The American freshwater flying-fish (Gastropelecus), which is found in the rivers of Guiana, has a deep sternum, or keel, to which muscles (comprising roughly one quarter of the total weight) are attached. These muscles compare favourably with those of birds, but in this species the wings are small and the method of propulsion is by beating the water with their wings.

Most, if not all, of the salt-water species have the lower lobe of the tail fin considerably enlarged (see diagrams) and on rising from the surface of the water the tail is always wagged vigorously from side to side with a sculling action.

The duration of flight may be anything up to half a minute, or even more, whilst the distance covered above water varies between 300 and 2,000ft or so. Flight generally takes place

* *British Museum* (*Natural History*) "*Guide to Specimens Illustrating Flight*" (1913).

† "*Animal Flight*," E. H. Hankin, *M.A., D.Sc.*

‡ "*The Evolution of Flying Animals*," E. Hanbury Hankin, *M.A., D.Sc.*

FLYING-FISH AERODYNAMICS . . .

just above the water surface, but on occasion a height of several feet is obtained, generally to avoid obstacles. No doubt the process of zooming up on to ships' decks, referred to by your correspondents, results in loss of speed and consequent stalling, thus making escape impossible. The speed of flight under calm conditions is about 30 to 35 ft/sec.

A factor of some importance, and one that seems to have escaped the notice of most observers, concerns the effect of wind. Several investigators have stated that flying-fishes remain airborne longer when flying against the wind than with the wind, and Hankin states : "The flying-fishes either started *head to wind* [italics added] or . . . steered so as to travel in an upwind direction." Other mentions are made to the effect that better performances are set up under windy conditions than in calm, and especially during the monsoons. Clearly, then, the wind must act as an aid to flight.

The correct solution of fish flight would appear to be as follows : The fish attains its maximum water speed, probably urged by the desire for self-preservation, and then pierces the surface to the air above. The transition from water to the airborne state is accompanied by violent tail-wagging, the emergence of the lower tail lobe being delayed for a brief period, and no doubt a noticeable speed increment is gained during this phase. After the tail is lifted the fish continues in more or less horizontal flight with gradual increase of wing incidence (similar to the hold-off prior to touch down of an aeroplane with tailwheel undercarriage), and with gradual loss of speed until stalling takes place and the fish falls back into the water. The flight can be prolonged again and again by lowering the tail prior to stalling and regaining speed by strenuous tail wagging. These additional "glides" are shorter than the original flight and have been observed to extend the distance by some 100ft and endure for about three seconds each.

If the fish emerges facing into wind, or substantially into wind, the air speed on emergence is equal to the speed on leaving the water plus the wind speed; but this must be qualified to some extent, because as the fish's body becomes exposed to the wind its forward resistance increases and, therefore, assuming a given maximum tail thrust effort, the speed on emergence, relative to the water, will be slightly less than when no wind is present.

It will be noticed that once the fish is in the air facing wind, the water, relative to the air (and apart from sea currents) is moving in the direction of flight and, as the flying speed decreases, so the apparent water speed tends to approximate to the fish's speed so that when the fish lowers its tail into the water there is little or no dragging effect and normal sculling can take place without difficulty. In other words, the fish obtains a much better purchase for its tail sculling than would be available in the absence of wind.

Upon emergence from the water the pectoral fins are flapped rapidly for a very short period, after which they remain still. This is most probably for the purpose of shedding excess weight in the form of water adhering to the fins, particularly between the ribs on the lower surface. A little thrust assistance may be obtained from this exercise of the fins, but there is not much evidence to support the theory, held by some, that wing flapping is the main method of propulsion.

A simple numerical example may help to clarify the above explanations. Let us assume that the flying-fish has a stalling speed of 20 m.p.h. and is capable of rising from the water at 30 m.p.h. Then, under calm conditions, the length of flight, free from sculling, is determined by the time taken to decrease the velocity through the air by 10 m.p.h. Now suppose a wind is blowing at 20 m.p.h.; if the fish emerges facing wind the initial air speed will be roughly 30+20, or 50 m.p.h., and flight can continue through a range decrease of nearly 30 m.p.h. The return to the water would be very gentle if the fish still faces the wind, since there would be little difference between the speeds of fish and water, or in other words, the "ground" speed would be practically nil.

Further, it will be seen that if the fish attempted to emerge down-wind it would not be likely to become airborne under the conditions considered but—equally interesting—once the fish is in the air it may turn down-wind and accomplish long distances over the water at very high "ground" speed, which does appear to agree with observations made during high winds. Down-wind flights are probably limited to the distance that can be attained by the initial impetus alone, since further tail-sculling would be difficult, if not impossible, on account of the big difference between the fish's speed and that of the water, whilst alighting would also take place at a high "ground" speed.

The method of flight outlined above bears some relationship to "dynamic" soaring flight practised by certain of the larger sea birds, e.g., the albatross, and for which a high wind is an essential factor.

Fig. 2 has been reproduced from Hankin's *Animal Flight* and is included as further evidence of the theory postulated above. It is of interest to note the citations which accompany the diagrams. The first figure is given as "Flying-Fish . . . gliding in unsoarable *air*," whilst the second reads "Flying-Fish . . . gliding in soarable *wind*." The italics have been inserted to accentuate the different wind conditions, which are stated to have been 19 to 24 m.p.h. for case (b) and calm air for (a). The two positions shown in the diagram obviously relate to slow and high speed flight, the alteration in the wing camber also being noticeable.

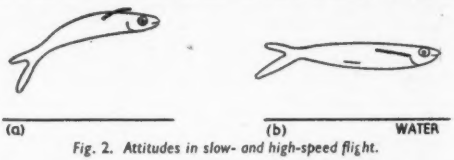


Fig. 2. Attitudes in slow- and high-speed flight.

If we believe in evolution of life, and it is difficult to do otherwise, it is a simple matter to imagine the commencement of fish flight. For instance, if a fish were to leap out of the water, perhaps in an attempt to escape some approaching danger, and found itself facing a fairly strong wind, then, by its simply extending its fins, some measure of support would immediately be felt, due to the relative velocity through the moving air. It would not be long before the value of such a strategical action became apparent to the fish; and continued practice, for eluding their enemies, would result in improvement of the technique till the present state had been reached. Reference to the British Museum *Natural History Guide* for confirmation on this point discloses the following information concerning the habits of flying-fish : "The various species of flying-fish . . . live in shoals in tropical and sub-tropical seas, and are pursued by large fishes such as the Tunny and Albacore." It could well be that survival of these species of fish has been largely due to their amphibious developments.

Flying-fish are given to making unintentional deck-landings. This photograph—which gives a good idea of their size—is from a recent cruising article by Dr. E. A. Pye in "Yachting World."

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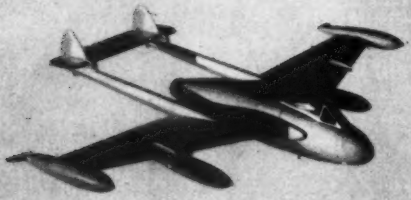

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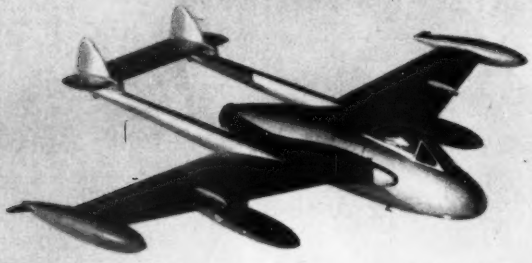

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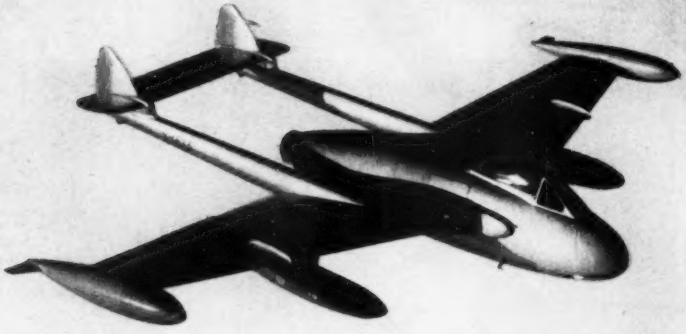


DE HAVILLAND

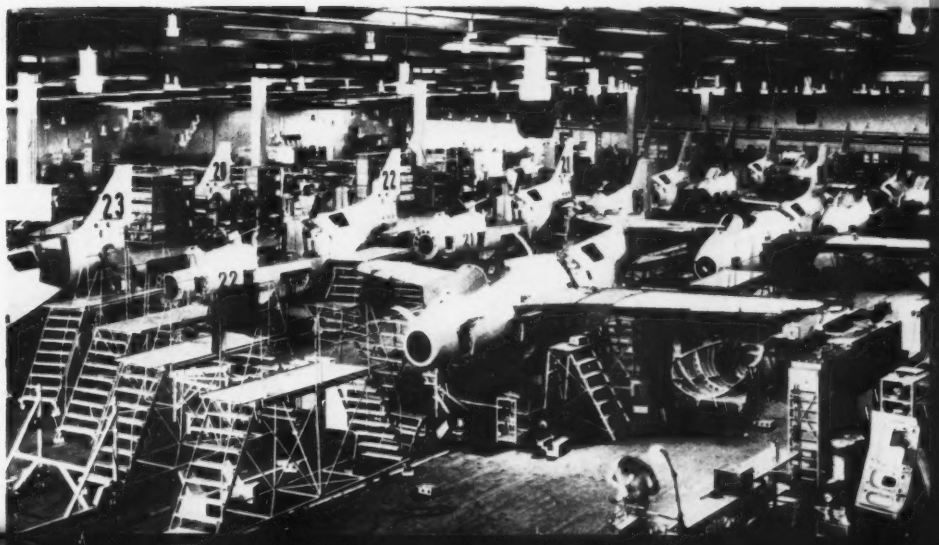
D/H AIRCRAFT

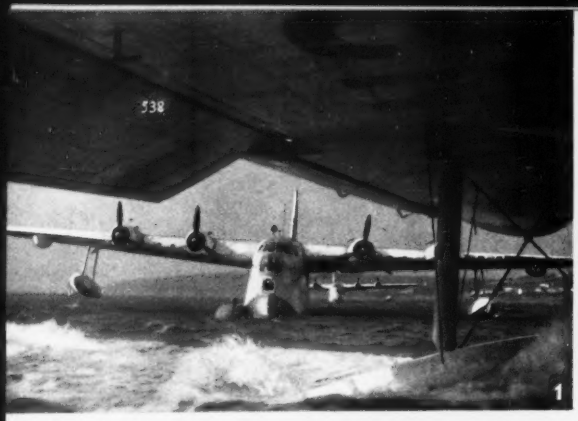
D/H ENGINES

SWEDISH FIGHTER

AT the Linköping factory of the Svenska Aeroplan Aktiebolaget (Saab Aircraft Company) production of the Saab-29 (J-29) jet fighter is well under way, and a number of these excellent machines are already in service with the Royal Swedish Air Force. The lower picture on this page shows the assembly shop (the Saab company inform us that this is "an early view") and the flight studies disclose, with hitherto unapproached clarity, features of "The Flying Barrel," as the J-29 is affectionately known throughout Sweden.

Performance figures have not been released, though the top speed is officially quoted as "about 650 m.p.h." Pilots are enthusiastic about handling qualities and the de Havilland Ghost turbojet, built under licence by Svenska Flygmotor A.B., confers a very high rate of climb. The armament is four 20 mm guns, with gyro sight. A description of the J-29 appeared in our issue of May 4th, 1950.





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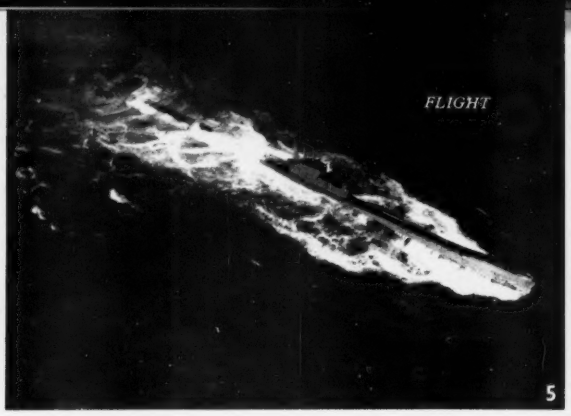

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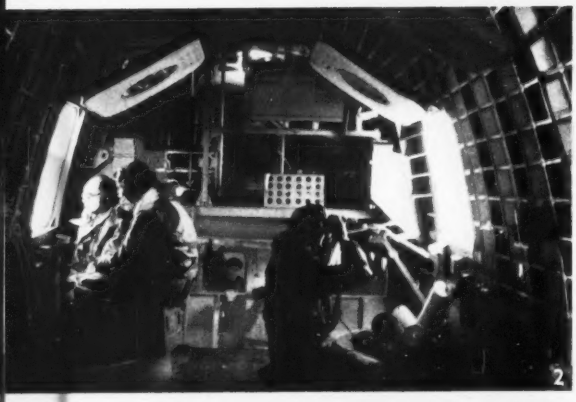

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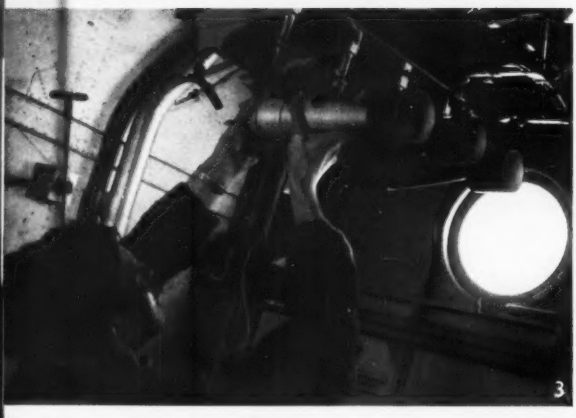

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A

B

Submarine Strike

(1) *Sunderlands awaiting their turn for duty at Pembroke Dock, seen from another taxying out for a patrol.*

(2) *Crew members, stationed at the beam 0.5in gun-hatches, search for hostile submarines.*

(3) *Attaching practice bombs to their carriers in readiness for an attack on an "A" class submarine.*

(4) *The submarine has been sighted and the bombs have been run out beneath the wings ready for the attack.*

(5) *H.M. Submarine "Alliance" seen from an attacking Sunderland a few seconds before the bombs were released.*

(6) *The submarine as observed from one of the beam machine-gun hatches immediately after the attack.*

(7) *The disturbance left by the submarine in crash-diving, seen while the craft was still at periscope depth.*

Convoy Protection

(a) *H.M.S. "Black Ranger," a 3,500-ton oiler of the Gold Ranger class, which formed part of a Blue Force convoy.*

(b) *This Fleet tug, seen in the Western Approaches, was part of the escort for a Blue convoy. A surface raider was prowling near.*

(c) *W/C. G. G. N. Barrett, A.F.C., captain of a Sunderland, exchanges signals with a Blue convoy-escort vessel.*

(d) *The 40-knot cruiser/minelayer H.M.S. "Apollo," which acted as a Red surface raider. "Apollo" is one of the Navy's fastest ships.*

(Impressions gained during patrols on the exercise are given elsewhere in this issue.)

AND PATROL

Incidents in Exercise "Assess," Photographed from a Coastal Command Flying-boat

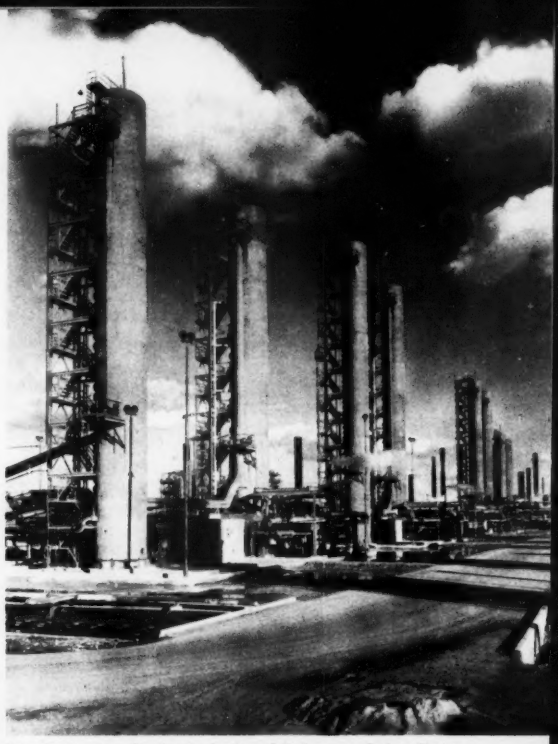
ABADAN AND AVIATION FUELS

The Nature of High-octane Aviation Fuels and Methods of Refining: Work of the Great Anglo-Iranian Plant

OCTANE number, and methods of fuel designation, are familiar to most people concerned with aircraft operation, but not everyone understands fully what they signify: this article explains them clearly. The subsequent description of refinery processes as practised at Abadan and elsewhere, though possibly requiring some elementary knowledge of hydrocarbon chemistry for full appreciation, serves to emphasise that the Persians have almost certainly bitten off more than they can digest, at least for some long time.

THE shutdown of the Abadan refinery last July has had a profound effect on the supply of aviation fuels in the entire Eastern Hemisphere. This, the world's largest petroleum undertaking, produced over a million tons a year of 91/98 and 100/130 grades of aviation spirit, which proved of incalculable value during the Second World War, and in the Korean campaign. Is it therefore of interest to trace the evolution of aviation-gasoline production, and facilities available (and now lying idle) for its manufacture at the Abadan refinery.

The steady improvements in aviation spirit since the first world war hinge on the discoveries made between 1916 and 1919 by Mr. (now Sir) Harry Ricardo. He was the first to observe the phenomenon of detonation, and blamed it for the frequent engine failures in aircraft between 1914 and 1918. He started testing fuels for their anti-knock qualities, using a single-cylinder test engine and expressing resistance to knocking by an H.U.C.R. (highest useful compression ratio) figure. Soon afterwards the Co-operative Fuel Research Committee established a laboratory-made hydrocarbon product with a very high anti-knock rating as the goal of efficiency for commercially produced gasolines. This product, known as iso-octane, was given the number 100, and another, with an extremely low anti-knock value, called heptane, was given the number 0. Thereafter a gasoline which on test produced, say, the same knock tendencies as a mixture of 27 per cent heptane/73 per cent octane, was said to have an "octane number" of 73.



Superfractionators for the production of high-octane fuel at Abadan.

Though not by any means showing the whole plant, this aerial view gives some idea of the vast extent of the Abadan refinery.

By 1930, 73-octane aviation spirit could be made from suitable crude oil by straight distillation and simple "sweetening" processes; and the economic limit in the manufacture of high-octane gasoline by such means was soon reached with a straight-run gasoline of 77-octane which proved suitable for the supercharged aircraft then being introduced. Meanwhile, Thomas Midgley was experimenting with additives to increase the octane numbers of straight-run gasolines in America. He found tetra-ethyl-lead to be particularly efficacious, and by its use fuels of up to 87 octane were achieved. It fell to the Shell Development Company in California to produce for the first time a commercially manufactured 100-octane gasoline in 1935. It was 50/50 straight-run material with synthetic blending agents, plus 4.8 c.c. tetra-ethyl-lead per Imperial gallon.

About this time research revealed that although fuels of the same weak-mixture rating, or octane number, have the same anti-knock value under cruising conditions (weak mixture) they may behave very differently under the rich-mixture conditions required at take-off. A new type of engine test was therefore devised to measure this property, which was thenceforward defined in the grade designation; 100-octane fuel, for instance, became 100/130 grade. Fuel with a knock rating of 130/170 has now been made experimentally. The highest knock rating required to date (and now ever likely to be needed, in view of the ascendance of the gas turbine) is 115/145, the fuel used in many American military aircraft and in the Bristol Hercules engines of the Handley-Page Hermes IV.

The adverse effect of various sulphur compounds on the "lead-susceptibility" of both motor and aviation gasoline is well established, and desulphurisation as a means of increasing octane-rating of leaded fuels is accomplished by various

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26 *October* 1951

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is without doubt at the moment unrivalled." *"Flight" May 4th, 1951.*

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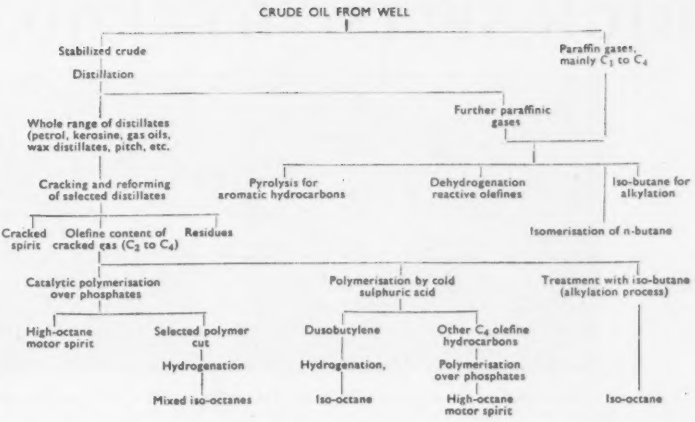
ABADAN AND AVIATION FUELS



"Family tree" of the principal refinery operations, including treatment of the principal gases

methods, two of which deserve mention, i.e., vapour-phase catalytic desulphurisation and hydrofining processes. Refineries are likely to make increasing use of these techniques, the more so as increasing amounts of "sour" crude oils from the Middle East are being handled. Leaded fuels tend to have a serious effect on valve seats and sparking-plugs. Shell's Thornton Research Laboratory has developed a technique for protectively coating valves with an alloy containing nickel, cobalt and aluminium.

Meanwhile fundamental research into detonation, pre-ignition and cognate problems is still being carried out in the Ricardo laboratories, where it has recently been found that knock in spark-ignition engines is connected with the production of peroxides in the combustible mixture. All this research, based on Ricardo's pioneer work, has enabled power outputs to be increased by 300 per cent and fuel consumption cut by 20 per cent.

Aviation gasoline of high octane-rating requires a superior base-stock of cracked spirit; alkylate made from processed refinery gases; iso-pentane, also a gas product; the anti-knock additive tetra-ethyl-lead; and inhibitors such as anti-gum. It entails production of base stocks and blending agents and the actual blending.

Natural petroleum as it comes from the well contains varying proportions of natural gas and crude oil. The former is separated and treated first in a gas-absorption plant, to free the lighter hydrocarbons for fuel gas, and later in a condensation plant to liquefy heavier hydrocarbons into base stock for aviation spirit and into natural gasoline suitable for use in motor petrol. The distillation of gasoline-range crude oil in a pressure-still yields useful fractions of gases, liquids and solids. Of these, straight-run gasoline is a suitable base stock for aviation fuel. Gas oil, next heavier than kerosine, forms the base for thermal cracking to produce a motor gasoline with a somewhat higher octane number than straight-run gasoline, and also the basic material for catalytic cracking to yield base stock for aviation spirit. There are three types of catalytic cracking plant in wide use: the Houdry fixed bed type (now also available as a moving-bed type); the Thermofor moving-bed type with catalyst in the form of pellets; and the fluid-bed type with the catalyst as a fine dust behaving like a liquid under pressure.

Refinery gases also yield three valuable blending agents. They are iso-octane, or codimer, produced by polymerisation followed by hydrogenation; alkylate iso-octane, made by single-process alkylation employing sulphuric acid as catalyst; and cumene, produced from benzol and refinery gas by a similar process, using hydrogen fluoride as catalyst. Both straight-run and catalytically cracked base stocks are mixed in various proportions with these and other blending agents, notably toluene and triptane, and with tetra-ethyl-lead to make aviation spirit of 100-octane or higher rating.

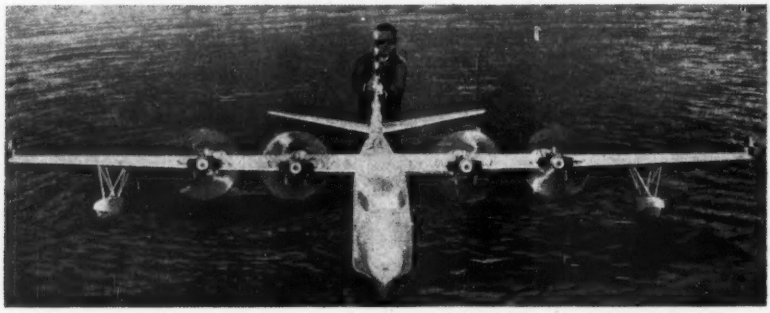
The manufacture of 91/98 and 100/130 grades of aviation spirit at the Abadan refinery entails production of iso-pentane, iso-hexane, iso-heptane, benzine extract and alkylate. The primary flash distillate containing the C_5-C_6 range of hydrocarbons is fractionated in successive steps for removal of propane and recovery of mixed butanes and iso-pentanes. Iso-heptane fractions are obtained from the overhead flash distillate from the residue left after the removal of iso-pentane and iso-heptane cuts from the atmospheric columns. A further production from the atmospheric stage is the so-called "benzine cut," containing 20 per cent of aromatics, forming another aviation-gasoline component. Butane and gasoline are recovered from the gas liberated on the distillation of crude oil. Reforming is resorted to for producing butenes for the alkylation process. Associated with the cracked spirit obtained from reforming is a pentane cut which is fractionated out of the spirit and alkylated with iso-butane to provide pentane alkylate.

The stabilized (depropanized) gasoline contains some 25 per cent. of butanes. These mixed butanes are recovered in a succeeding distillation, and passed forward *via* a mercaptan removal unit to the alkylation process for the recovery of iso-butane, which may amount to 20 per cent. The balance (normal butane) provides feedstock for the ancillary isomerisation process. Since iso-pentane is included as a blending agent in aviation spirit a certain proportion of the debutanized gasoline is fractionated to furnish about 4,000 barrels a day of this product. After removal of iso-pentane a part of the gasoline is passed to storage tanks, from which it is pumped to fractionating columns for removing 5,700 barrels a day of iso-hexane concentrate. By "topping" and "tailing" the iso-hexane base, a product is obtained which, upon acid treatment and re-running for sulphur removal, is used as a blending agent for 100-octane aviation spirit. The fractionated "tops" of the iso-heptane base provide an additional base stock for iso-hexane. The middle cut of 7,000 barrels a day of iso-heptane, after treatment with 98 per cent sulphuric acid and redistillation for sulphur removal, is blended in 100/130 grade aviation spirit. The first side-stream from the atmospheric column contains about 20 per cent of aromatics, which are extracted with liquid sulphur dioxide in an Edeleanu-type plant. The extract, after sulphur removal, has a fairly high octane number and a high rich-mixture number.

Alkylation capacity at Abadan, consisting of three separate units, is 10,000 barrels a day. Associated with each unit is an isomerisation plant, each of 2,000 barrels daily of net iso-butane. Two anhydrous hydrogen chloride plants produce the acid for activating the aluminium chloride catalyst in the isomerisation process. A 20,000-barrels-a-day sulphur dioxide extraction unit provides the benzine extract of aromatics; associated with it is a plant for producing sulphur dioxide at two tons a day. Sulphuric acid for the alkylation process is manufactured in an adjoining plant. Only butenes and pentenes among the gas from the cracking units are utilized as feedstock for the alkylation units. The percentage recovery of butane in the crude oil is kept at a high figure by the control of vapour pressure of the crude fed to the refinery. This iso-butane content ensures maximum production in the alkylation process.

V.S.S.

HIGH-SPEED HYDRODYNAMICS



The radio-controlled dynamically similar model of the Convair XP5Y-1 which made more than 2,000 test runs.

A Review of Trends and Developments: Mr. E. G. Stout's Anglo-U.S. Conference Lecture

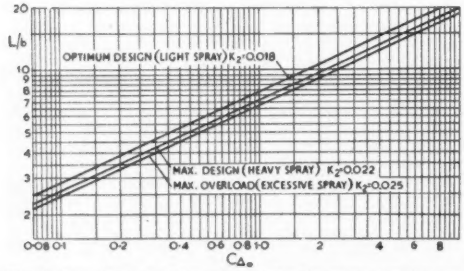
IN his paper entitled *A Review of High-Speed Hydrodynamic Developments*, read at the recent Third Anglo-American Conference, Mr. E. G. Stout, B.S.M.E., Aero.E., A.F.I.Ae.S. (who is Assistant to the Chief Engineer, Consolidated Vultee Aircraft Corporation), remarked that early efforts to construct water-based aircraft had "leaned heavily on the experience of the naval architect." For the most part, he said, design had followed the trend of highly refined displacement hulls.

This error, he continued, was not immediately apparent, as the large flying-boat had met with continued success at every turn. When, however, the full impact of this situation was realized, in the years just before the Second World War, it became evident that the research methods and dogma of the naval architect would have to be replaced by a new concept.

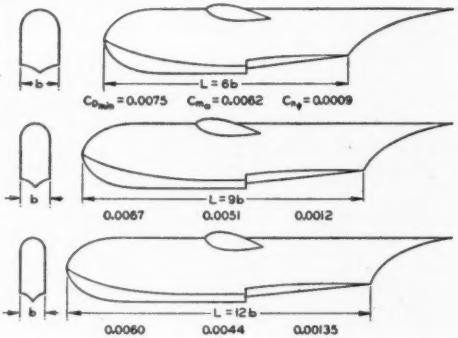
The first step to implement such a radical revision was to initiate comprehensive programmes of research designed to investigate new principles of hydrodynamic sustentation that would conform more closely to the requirements of high-speed aerodynamic design. Immediately upon taking this step it was realized by the lecturer that there was not a research technique available that would lend itself to such a study. After much investigation and analysis, the work in England of Coombs, Perring, Johnston and Hutchinson came to his attention. Their investigations were concerned with the development of a research technique through the employment of dynamically similar models. The first application of the technique in the United States, although crude by present standards, had resulted in a 60 per cent increase in the operational gross weight of the Coronado flying-boat. As little time was available in the towing tanks for the research programme, the Consolidated Vultee Hydrodynamics Laboratory initiated, in 1943, a programme to develop dynamically similar free-body, self-propelled models, remotely controlled by multi-channel radio.

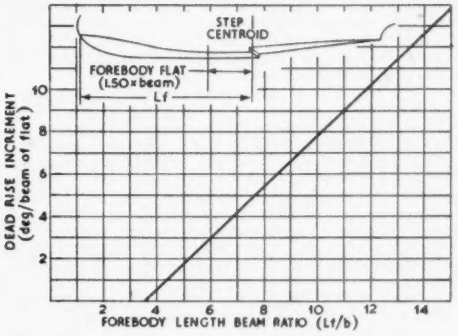
Dealing with subsonic developments, the lecturer said that by May of 1945, the techniques and precedures for operating the radio-controlled models had been demonstrated favourably, but in spite of the temptation to embark immediately upon a broad programme of research it was realized that there was much to be learnt by studying conventional marine aircraft in the light of this new design concept.

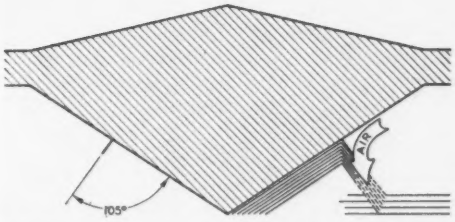
After discussing the powerful influence of the length-beam ratio upon load-carrying ability in conditions of constant spray and resistance, the lecturer called attention to one phase of the study which, although it seemed unimportant at the time, in reality formed the nucleus of later transonic and supersonic research. This phase was directed towards the development of improved spray-suppression devices, known later as "spray dams." The conventional vee-bottom planing surface, which had been employed for years in classical research on planing phenomena, had never proved satisfactory for a flying-boat hull, because of the high level reached by the spray after leaving the chine. Rule-of-thumb criteria had dictated some form of transverse curvature, called "chine flare," in the bottom of conventional hulls. When extreme overloading of all conventional flying-boat types became a critical problem, extensive studies were initiated to determine the maximum influence on spray



(Above) Hull beam selection chart giving the relationship between length/beam ratio and load coefficient for constant values of K_2 (L^2b=constant). K_2=0.018 has been found a fair assumption, and K_2=0.022 should not be exceeded. (Right) Influence of length/beam ratio on aerodynamic characteristics, N.A.C.A. high L/b hull series.







(Left) Linear variation of deadrise forward of the step to maintain lower limit stability with increase in length/beam ratio. (Above) Cross-sectional view of a blended-type hull, illustrating diagrammatically the action of the "spray dam."

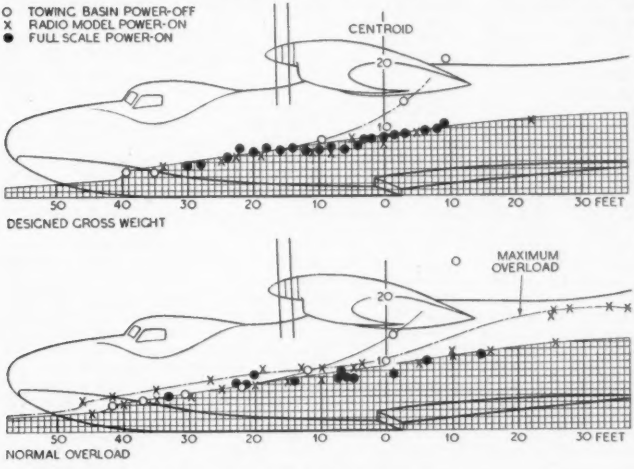
height that could be attained through modification of transverse curvature. It was determined that a radius too small or abrupt would act only on the layer of water immediately adjacent to the hull, and that the inertia of the unaffected mass would carry it along the local curvature with little change in direction. Similarly, if exaggerated reflex flare were employed, the adjacent layer would actually rebound from the unaffected mass and rise higher than if no flare at all had been used.

During the course of isolating the effect of downward deflection of the chine a simple expedient had been employed. This consisted in attaching a metal strip to a hull without flare and then progressively deflecting this strip while recording the spray height. Beyond a few degrees of deflection below the horizontal, the reflected spray became steadily worse, as in the case of the exaggerated reflex flare. Following the course of many research investigations, the study was continued *ad absurdum* and upon the spray dam approaching a nearly perpendicular position an interesting phenomenon occurred, in that marked reductions of spray height were noted.

It was concluded from these tests that the increased effectiveness was due to the sharp intersection of the strip with the hull bottom which, in effect, acted as a dam. This powerful effect was lost where the lowered chine was faired by using reflex flare or a fillet of any nature. Because of obvious structural limitations, this highly effective spray strip was not considered feasible for application to conventional hulls, and in view of the outstanding success which had been observed through the use of a high length/beam ratio, it was eventually concluded that further study was not necessary.

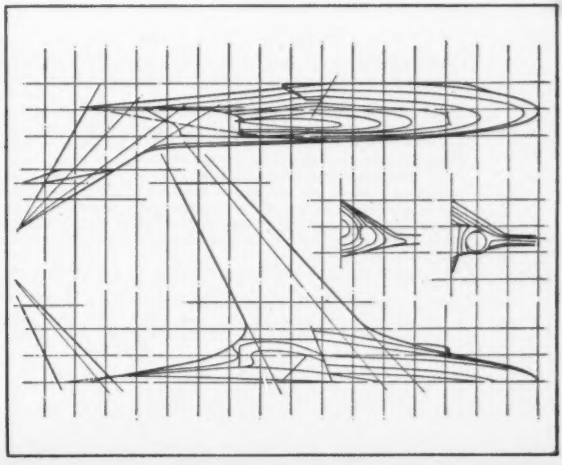
The lecturer then dealt with the next phase of the research programme, in which were explored the possibilities of incorporating turbojets into an efficient hydrodynamic configuration. Convair had just completed one of the first jet bombers to be built in the United States, the XB-46, and it appeared logical to start with this design and attempt to "water-base" it with a minimum of revision. Various approaches were made, using extreme length/beam ratios, light loading and other schemes; all of these configurations incorporated the basic elements of conventional hulls such as sharp chines and steps, and did not provide the static buoyancy or spray control required without incurring excessive frontal area and, hence, aerodynamic drag. At this stage, the early work with perpendicular spray strips was recalled and, deviating completely from established naval architectural practice, a generous wing/hull fillet was added to the original XB-46. To keep the thickness ratio aerodynamically within reason, the plan form was faired generously into the bow and stern fuselage.

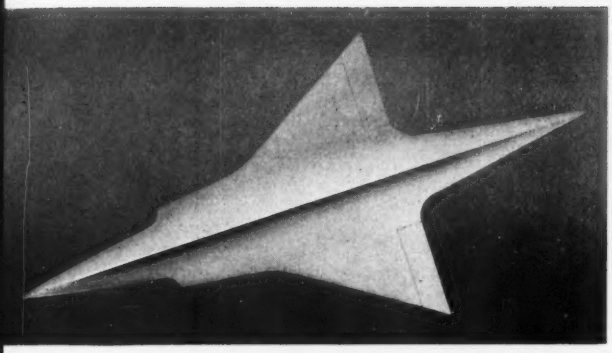
Proceeding in this manner, a simple



(Left) The loci of maximum spray crests on the XP5Y-1, showing the correlation between model and full scale for design gross weight, normal and maximum overload.

(Below) Typical hull lines and offsets for a transonic blended-hull configuration incorporating high Mach number buttock sections. It can be seen that there is no apparent distinction between hydrodynamic and aerodynamic functions.





Mr. Stout's striking conception of a supersonic blended-hull configuration incorporating a 60-deg deadrise.

HIGH-SPEED HYDRODYNAMICS . . .

bridle-towed dynamically similar model was constructed in order to obtain a preliminary check on the hydrodynamic characteristics of the configuration. Preliminary towing tests were highly encouraging; after a series of minor revisions and adjustments in the step and spray-dam design, it was concluded that spray could be controlled adequately at the design gross weight, and that hydrodynamic stability was satisfactory. From these preliminary tests it was determined that the spray dam obtained its effectiveness by violently agitating the main spray blister and mixing it thoroughly with air. This aerated mass was deflected downwards with great force in a high-velocity jet and, because of the high content of entrained air, this water mass penetrated the free water surface with little or no rebound or reflection.

Mr. Stout then reviewed the application of the basic criteria to an actual full-scale subsonic design. This led to the XP5Y-1 flying-boat which, fitted with four Allison T-40 turboprops, first flew in April, 1950. Initial flight tests corresponded to the model results very closely; in fact, the hydrodynamic characteristics were of sufficient excellence to justify flying the aircraft at its design gross weight on its seventh flight, at which time it established the world's endurance record for turboprop aircraft.

Dealing with the adaptation of transonic aircraft design to water-based operation, the lecturer said that it was obvious from the outset that extensive aerodynamic refinement of known hydrodynamic forms would result in poor hydrodynamic performance without ever fully obtaining the aerodynamic cleanliness required for transonic flight. It appeared logical, therefore, to start with an ideal aerodynamic configuration and, by means of extensive hydrodynamic research, to develop new principles and applications; these, although different in concept, would result in the same degree of seaworthiness and stability normally associated with the best hulls of conventional forms.

By this reasoning, it was obvious that the basic configuration must consist of a smooth, unbroken form using sections of high critical Mach number throughout. In order to secure elementary flotation it would also be necessary to supply sufficient volume of body so that engines, air intakes, jet exhausts and personnel would not be inundated. The combination of these two fundamental requirements and the preliminary data obtained from the XB-46 studies, led logically to the blended wing/hull configuration. It was determined that straight transverse and buttock sections could be employed without altering the critical Mach number of the form.

As a result of these geometric considerations it was also established that this elementary flotation body, by virtue of its inherently low centre of gravity and high water-plane inertia, would have static transverse ship stability, i.e., it would float upright without recourse to auxiliary devices such as wing-tip floats. By this means it became apparent that a true aerodynamic form could meet adequately, or in some cases exceed, many established hydrodynamic design criteria.

Mr. Stout then discussed the four-year research programme devoted to the hydrodynamic characteristics of nine separate blended-hull configurations known as the "Skate" project. He included such items as the latitude that existed for the optimum selection of planing surface proportions, the influence of linear warping, and details of the retractable spray dam and main step.

He then referred to supersonic developments, saying that in view of the broad background and experience that had been gained with the Convair XF-92A 60 deg delta-wing land-based aircraft, it was natural that such an aerodynamic configuration should be employed in the supersonic hydrodynamic-research programme. To account for the increased impact loads due to a higher take-off speed, the deadrise was increased to give the same structural load required for conventional design. With the power loadings that would be available, it was the lecturer's opinion that high-deadrise hulls held out great promise for successful rough-water operation at high planing speeds.

Mr. Stout concluded by saying that the supersonic approach so far discussed might not be the most desirable solution to the problem. It had been presented more as an example of the line of thought that would provide a solution, rather than as the fact. With the research programme well into considerations of supersonic design, it was safe to say that the probability of achieving the original objective of this effort was excellent, and it was not too early to take serious cognisance of the existence of this versatile new weapon and give high-speed water-based aircraft serious consideration in strategic planning.

YOUR BALL, SIR

THE following news story from Montreal not only seems too good for the spike (editorial home of lost causes), but even deserves printing exactly as received :—

A man who claims to have helped build the "fantastic flying ball" which four northern New York state residents said they saw, says it is a plastic, egg-shaped balloon measuring about six feet across and powered by an electric motor.

The ball, press report from Hogansburgh, N.Y., said, was seen to land and take off and vanish in the air over Massena, N.Y.

A man who gave his name as Arthur Greenwood called press associations and said he helped one Edward of Toronto build the thing. Greenwood said he lived in New Toronto, a Toronto suburb.

Greenwood said the contraption is a motorized balloon capable of speeds up to 210 miles an hour. It could take off almost vertically while "hanging" on its electrically-driven propeller.

On its flight Tuesday, Greenwood said, it "took off from a secret hiding place near Ancaster (near Hamilton, Ontario) and returned to another hiding place near Toronto." Further, it would be flown over Niagara Falls at the week-end.

After giving these details, the man hung up. He called back 10 minutes later, saying :

"I ran out of nickels, I forgot to say it has a range of only 450 miles. The motor is light—only 269 pounds."

He then hung up.

STUDYING RUSSIAN AIRCRAFT

ACCORDING to the Cornell Aeronautical Laboratory, which has been making a detailed examination of a Yak fighter and an Il-10 ground-attack machine, Russian aircraft design is as good as American. A spokesman of the laboratory is quoted as saying, "Where excellent workmanship counts in respect to performance, Russian workmanship is as good, and in some cases better, than ours." He added that the Yak was evidently built by people who knew aircraft construction as well as anv American manufacturer.

No detailed information concerning the Mig-15 jet fighter now under examination at the Wright-Patterson Air Force Base, Dayton, Ohio, has yet been released.

WEATHER AND WAR

Chief of the Air Staff Addresses the Royal Meteorological Society

At the first annual dinner of the Royal Meteorological Society in London on October 17th, Marshal of the Royal Air Force Sir John Slessor, G.C.B., D.S.O., M.C., Chief of the Air Staff, spoke of the use of the weather in war.

About 36 years ago, he recalled, when he was a young officer in the R.F.C., Sir Robert Watson-Watt (retiring president of the Society) was "pulled into the Met. Office" by Sir Napier Shaw to conduct research, for the benefit of aviation, on the location of thunderstorms by radio. "I can't honestly say," said the C.A.S., "that in those dim days I really had any glimmering of consciousness of what a met. service could do for one. My very first operational sortie was in an old 2C from a stubble field on the farm of the excellent Mr. Sutton at Hornchurch. I was despatched on the night of October 13th, 1915, by an order over a rather bad field telephone line, direct from the War Office to my tent, to intercept three Zeppelins. I got off the ground about 8 o'clock, chased, but failed to catch, one Lieutenant-zur-See Ritter, in a Zeppelin somewhere over the East End, and descended about an hour later to find a nice thick fog lying over Mr. Sutton's stubble field. The result was a considerable deterioration in the condition of the aeroplane. Of course, a Met. Service on modern lines would have forecast that fog, and control on modern lines would have diverted me to another airfield; but we didn't enjoy those luxuries in those days."

The Meteorological Office, the C.A.S. recalled, existed long before the time of which he spoke. As early as 1910/11 the War Office arranged for a meteorological branch at the factory at Farnborough to help the "bold aeronauts of the Air Battalion R.E."—the father of British military air forces. That was the first instance of a meteorologist being "laid on" to assist airmen. The first Advisory Committee for Aeronautics, set up in the early days of the R.F.C., included Dr. Shaw, the D.M.O. of the day, as one of its leading members. In those days Shaw and the Dines (father and son) and C. J. P. Cave were making great strides in the exploration of the upper air. "One reads," said the speaker, "of dark deeds with balloons at Manchester and Petersfield. I'm told that of 40 balloons released with instruments only three failed to reach the stratosphere—and that in days when the ordinary airman, like myself, had not the foggiest idea that there *was* such a thing as the stratosphere."

The first war, he continued, caused a great increase in the number of meteorologists and in the organization for Met. observations, though, if his memory served him right, Met. was a matter of interest more to the gunner than to the airman. He certainly had no recollection of ever seeing a "met. bloke" anywhere near a squadron in that war, and met. briefing, if any, consisted of some simple rustic observations such as, "It'll probably be all right—there was a nice red sunset this evening," or, "The swallows are flying nice and high." In less favourable conditions no one spoke of Q.B.I., or I.F.R., conditions : one said, "Sorry, old boy, but even the gulls are walking."

Modern Technique

Since 1939 there had been a really tremendous advance, especially in the observational side of meteorology, and it was during the same period that the colossal step forward in the range, speed and carrying capacity of aircraft had rendered good weather information vital to the airman.

Since that year the adoption of radio to telemeter measurements from balloons, and the use of radar for tracking the balloons, enabled temperature and wind to be measured regularly, several times daily, at about eight stations in this country and on the two British Weather Ships. Heights of 50,000-60,000ft were attained and—on an experimental basis at least—even 100,000ft. Thus, in the matter of height, the meteorologist was still well ahead of the needs of the manned aircraft. The C.A.S. said that he understood also that in the accurate and systematic measurement by radar of winds at great heights Britain was also ahead of any other country. The radar exploration of cumulo-nimbus clouds and precipitation continued to bring knowledge of much value to the airman, the airframe designer, the designer of protective devices against icing, and so on; but if meteorology did much for aviation, the flying man also gave great service to meteorology. There were numerous observations, for example, on clouds, and the physical conditions and processes going on within them, which could only be studied from manned aircraft. The Meteorological Reconnaissance Flights operated by the R.A.F. during and since the war had yielded observations to the forecaster, and for many years daily "vertical" climbs had been made by fighters to the greatest height attainable. "Many of us remember," said the C.A.S., "the old Gladiator, which was doing that job most effectively long after its normal retiring age."

Reports from operational aircraft of cloud base, cloud tops, icing, turbulence or other hazardous phenomena were essential for the day-to-day operation of the meteorological service, and reports from aircraft traversing oceanic or sparsely populated areas were a valuable addition to the synoptic network. The Meteorological Research Flight at Farnborough, for which the R.A.F. supplied the aircrews and the Meteorological Office the scientific observers, had rendered unique service to meteorological research. It had brought new knowledge about the amazingly low humidities in the stratosphere and much information on the physics of cloud and precipitation.

Lessons to Learn

"I do not derogate or minimize in any way," continued the C.A.S., "the great debt which the R.A.F. owes to the meteorologist, when I admit that I have not always been entirely satisfied that the organization of the Meteorological Service for the R.A.F. was as effective as it might have been. Early in 1943, when I was C.-in-C. Coastal, I and my opposite number in Bomber Command —'Bert' Harris—held rather definite views on that subject—views which, I may say, were expressed somewhat more pungently and picturesquely at High Wycombe than at Northwood. I do not wish to be controversial, or rush in where angels fear to tread; but we must be careful in this, as in all other fields, to make sure that we take advantage of the lessons learnt from the last war insofar as they may be applicable to the conditions of a possible future war. One of these lessons surely is that, in war, weather can (and should) be used as a weapon, and the met. officer should be a fully responsible member of any air operations staff. One of my most harrowing recollections of the war was the passage of the *Scharnhorst* and *Gneisenau* through the Channel in February, 1942, when No. 5 Group, which I was then commanding, had very heavy casualties in a desperate attempt to cripple them. The effect on the war at sea would have been so enormous as to justify facing the inevitable cost. But my point is that, through German eyes, that operation was an almost perfect example of the use of weather as a defensive weapon—it was admirably planned, and the front which they knew would be across the Channel at the time of the passage was more effective than a flotilla of destroyers and a group of fighters.

"Rundstedt's winter offensive in 1944 was another classic example of the skilful use by the soldier of weather which, in that case, completely neutralized our overwhelming air superiority and grounded our bombers—though there was, of course, no prospect at that stage of the war of the weather holding out for long enough to enable the Ardennes offensive to be anything more than a temporary embarrassment."

The American General Kenney, the C.A.S. continued, had claimed that the attack on Lae in September, 1943 (launched on the basis of a forecast of impossible flying conditions at Japanese bases with blue skies over the beaches of New Guinea) was "the first time in history when D. Day and H. Hour for the attack of an Army on land had been determined by an Air Force meteorologist." No doubt that was true; but it was a fact that three years before—in August, 1940—the date of the opening attack in the Battle of Britain was based on the forecasts of the Luftwaffe met. officers.

Midway, the Coral Sea battle, the Japanese attack on the Aleutians, and the American landings in the Solomons all contained examples of the use, by aircraft carriers, of moving fronts, for concealment and cover of attacks launched against an enemy "in the clear."

Air operations from shore bases could take equally good advantage of the skilful use of weather as a weapon. "We used it as such," the speaker recalled, "on many occasions in Bomber Command ; for instance, in the raid on Milan, in October, 1942, when we crossed France by day under weather cover. And perhaps one of the boldest decisions of the war was when Air Marshal Cochrane—knowing there would be fog at bases on return and that the German meteorologists would count on Bomber Command being grounded—got in an effective attack on an especially important target in clear moonlight without loss, and brought all his bombers safely in on Fido. That would have been impossible without first-class met. advice.

"We all know," he added, "that meteorology is not an exact science; but nor is war, and meteorology is not the only weapon that can let you down if you have bad luck or use it unintelligently."

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Naming The P.1067

HAVING read the editorial in *Flight* of October 12th, I feel that I may as well put in my two cents' worth on the subject of a name for the P.1067.

I am in entire agreement with you that a name for this magnificent aircraft is somewhat overdue, and my own choice, which I have had in mind for some time, is "Rapier," which seems to me to sum up all the characteristics of this fighter.

I realise that this name was used by Napiers for one of their engines, but do not recall its having been used for an aircraft before, at least not during the past 20 years, though I am quite happy to be corrected on that point.

Incidentally, amongst the names you list, it would seem that "Wraith" is a natural for the D.H. 110, unless of course D.H.'s have it in mind for their next engine!

Newbury, Berks. S. WOODS,
Royal Observer Corps.

APROPOS your leader "Names and Fames . . ." and my letter in the same issue, I feel that one answers the other.

What more fitting name could be given to the P.1067 than that of the pilot whose name is so connected with its predecessor, the P.1081? Why not call it the Wade?

Guildford, Surrey. F. E. BURDETT.

An Early Delta

AS a member of the Royal Observer Corps, I take a great interest in aircraft and have done so since 1911. I recently visited the Farnborough Show and saw certain delta-wing aircraft, and I think it is generally accepted that this design is something quite new.

I remember, however, seeing a machine of this design at a Brooklands meeting about 1911 (I forget the exact year). It was shaped like a paper dart and made several attempts to take off, but failed. I have never seen an illustration of the machine in any aeronautical paper, or any description of it. Can anybody tell me the name of the machine, and who designed it?

Midhurst, Sussex. J. M. FURNEAUX, JNR.

Admiralty and Coastal Command

I AM sorry that Mr. J. B. B. Paul, of Toronto (October 5th) finds my arguments hard to follow. If he will let me know in what respect perhaps I can elucidate for him.

With regard to my statements, the facts given by me are accurate; the inferences to be drawn from the facts can, of course, only be opinions, and as such accepted or rejected on the evidence available. Here again, perhaps Mr. Paul will be good enough to let me know which of my statements he considers inaccurate.

The one *fact* which Mr. Paul ignores is that there is no division between the air over the sea and the air over the land. Given that the Admiralty is responsible for the protection *on* the sea of convoys, we must also admit that the Army is responsible for the guarding of railways. On this argument the only function left to the Royal Air Force is that of strategic bombing.

Nowadays strategy is decided not by any of the three Services, but by war cabinets. Experience and reason both argue that tactics and technicalities are best left to the specialist in that branch and that, where necessary, co-operation between the various sections of the armed forces is more efficient than the control of one specialist by another.

Epsom, Surrey. W. N. CUMMING.

An "Imperial" Route?

I WAS very pleased to learn that our airline operators envisage, for the future, two all-British round-the-world air routes, and that plans are already under way for its realization. However, I also hold the opinion that the time is long overdue when a separate airline, exclusively for service within the Empire, should be formed both to reduce B.O.A.C. to a manageable and economical size, and to draw our somewhat drifting dominions into closer unity and promote in even the most distant a feeling of progress and modernity.

In considering the opportunities for a "British Empire Airways" I was struck most forcibly by the strategic position, on the American continent, of British Honduras. Its central location affords access by air both to the United States and to Spanish America—places where British influence ought more often to be felt—while it could be unique in connecting the Western Hemisphere with the Antipodes. Such a route as I contemplate would lead from Britain *via* the Atlantic to Bermuda, the Bahamas and Jamaica, to Honduras, and thence a 3,000-mile leg to the tiny British island of Ducie, in the South Pacific, where a link-up with the projected Australian route to Valparaiso might be effected.

Provided that suitable alighting areas were available the Saro Princess could make this journey with ease.

I would be glad of your readers' criticism as to the practicability of the idea, since I feel that something of this nature is not only desirable but necessary, if only for prestige.

Dundee, Angus. IMPERIALIST.

The Light Brigade in Racing

MAY we encroach on your Correspondence Column once again, to register our annual protest on behalf of the slower light and ultra-light-class aircraft owners concerned in the Daily Express South Coast Air Race recently held?

Last year many of the ultra-light and slower light aeroplanes were eliminated from this race because they were out of range, but this year we had a new one sprung on us, and were rejected because there were too many entries. We fail to see why the great British newspaper which was sponsoring the race did not eliminate foreign entrants in favour of the British, if there were too many entries. If they were to be limited it should in any case have been announced with the rules. We have no complaint, but it does seem there is some discrimination against the slower light and ultra-light owner. We congratulate the winner, especially as he was in the ultra-light class, and also the newspaper for its intelligent interest and support in sponsoring this very fine race, but when, oh when, are we going to get a real chance?

Bristol. TWO ULTRA-LIGHT OWNERS.

Technicians' Farnborough Tickets

AS a stressman employed by a large aircraft firm in the home counties, I would like to endorse the remarks made by "Torque Tube" in a letter published in *Flight* of October 5th. The letter was concerned with facilities, or lack of them, available to technicians for visiting the Farnborough Show on the "private" days.

From the methods of distribution which are applied by the firm I work for, it is clear that four out of five of those employed in the technical office and the majority of draughtsmen are unlikely ever to be able to get near to the aircraft at the Show, unless, of course, they have some other source of supply of tickets.

I understand on enquiry at the S.B.A.C. offices that it is necessary for a technician to be sponsored by his firm. Could not something be done to give a fairer deal to the large number of junior technicians who are unable to get tickets through their firms?

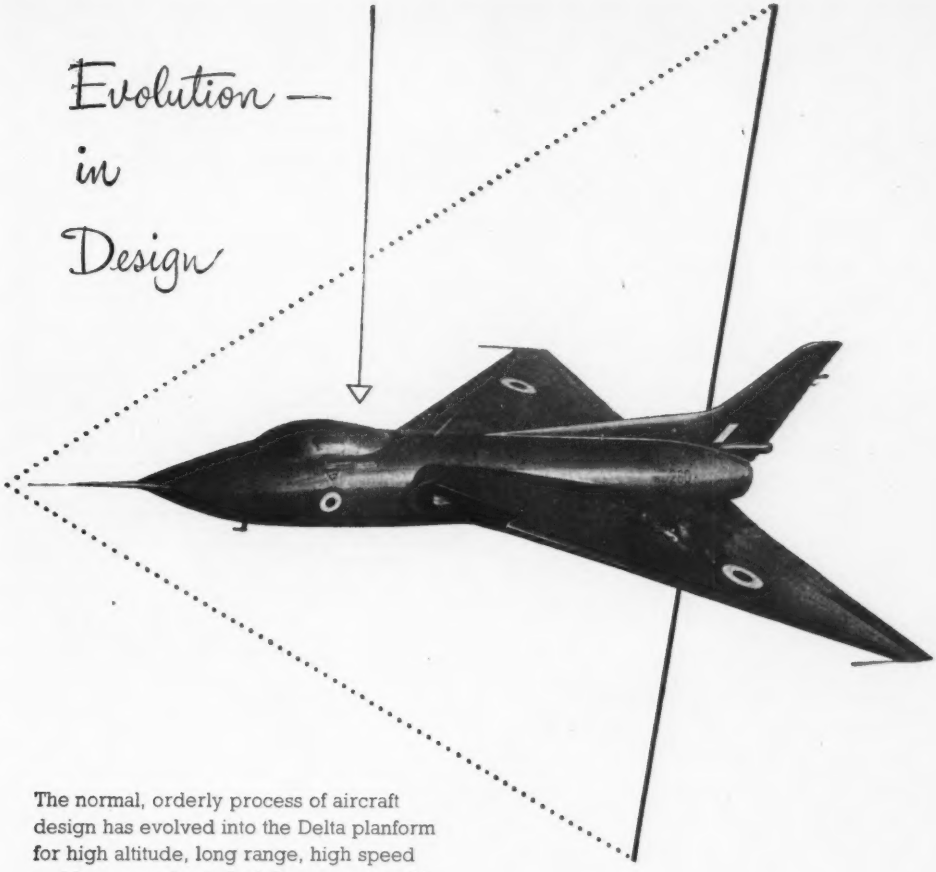
Possibly some tickets could be made available to the Graduate and Student Section of the R.Ae.S. since many of the technicians in question are members of local branches of the Society.

Middlesex. STRESSMAN.

FORTHCOMING EVENTS

Oct.	30.	Society of Instrument Technology: "Materials for Instrument Manufacture," by E. B. Moss.
Oct.	30.	R.Ae.S. Section Lecture: "Supersonic Propellers," by Dr. W. F. Hilton, A.F.R.Ae.S.
Oct.	31.	Royal Air Force College, Cranwell: Boxing v. Oxford University (away).
Nov.	1.	R.Ae.S. "Hydrodynamic Development" Films (Ernest G. Stout).
Nov.	3.	Royal Air Force College, Cranwell: Fencing v. Cambridge University (home).
Nov.	6.	R.Ae.S. Graduates and Students Lecture: "Production Research", by L. E. Bennett.
Nov.	14.	Royal Air Force College, Cranwell: Rugby v. R.A.F. XV (home).
Nov.	22.	R.Ae.s.: "Problems of Transonic Flight", by A. M. Clifton, B.Sc., F.R.Ae.S.
Nov.	23.	Helicopter Association: "The Giant Helicopter," by O. L. L. Fitzwilliams, B.A.
Nov.	24.	Society of Licensed Aircraft Engineers: Main Lecture: "Functioning of a Manufacturer's Servicing School," by D. W. Richardson, M.B.E., A.F.R.Ae.S.
Nov.	24.	Royal Air Force College, Cranwell: Rugby and Squash v. R.N.C. Greenwich (away); Soccer and Rifle Shooting v. R.M.A. Sandhurst (away); Old Cranwellians Dinner (London).
Nov.	27.	R.Ae.S. Section Lecture: "Aircraft Simplification v Efficiency", by W. S. Farren, C.B., M.B.E., M.A., F.R.S., M.I.Mech.E., F.R.Ae.S.

Evolution — in Design



The normal, orderly process of aircraft design has evolved into the Delta planform for high altitude, long range, high speed and heavy payload. And Avro's successful 707A and B demonstrate one further important point—the Delta handles like any conventional aircraft.

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CIVIL AVIATION

STOP—TO THINK

LORD OGMORE, Minister of Civil Aviation, has announced that the official term for helicopter passenger stations is to be "airstop," and it seems that the name was chosen from some seventy suggestions—including "up down" and "rotorpodio"—by an unofficial committee of "well-known men of letters."

We do not know what considerations led these gentlemen to select "airstop," but our first reaction is one of no enthusiasm. "Stop" in itself suggests a protracted period on the ground or a landing for good, and this is completely in opposition to the plans for helicopters, which are expected to make a brief, in-transit pause. Though, admittedly, road transport has "bus stops," we cannot help feeling that "air halt" (a modification of railway terminology) would both sound happier and be more indicative of the true nature of the object. "Rotor, Station," as currently used, is admittedly over-long.

But either "airstop" or "air halt," though concise and easily pronounced by a foreigner, is uninspiring. There is much to be said for such a name as "rotorport" or "rotoport," which would be at once descriptive, pronounceable and likely to be understood by most nationalities. Before the adoption of an important term which will be in common usage in a few years' time and may find its way permanently into the British language, we would like to see a representative users' committee of "men of aviation," such as the readers of *Flight*, confirm or otherwise the choice of Lord Ogmore's "men of letters." Incidentally, for London, a 300ft square riverside site near Waterloo Station is under consideration.

B.E.A.'s IMPROVING FINANCES

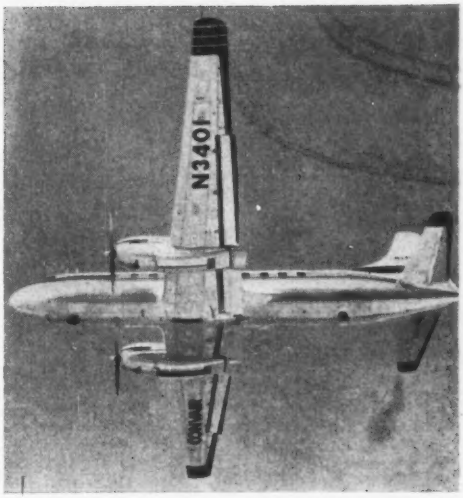
THE latest statement on B.E.A.'s financial progress shows that the steady trend of improvement is being well maintained. A profit of £106,206 was made from operations during the first five months (April to August) of the current financial year. During this period traffic increased by 28 per cent as compared with the previous year, while during the peak months of the summer the Corporation was carrying passengers at a rate representing 2,000,000 per year. The load-factor rose from an average of less than 60 per cent in 1950-51 to almost 66 per cent for the first five months of the year 1951-52.

On the other side of its balance sheet, however, B.E.A. has to reckon with rising costs of operation, which, like those of every other European airline, have soared during recent months. This is perhaps best illustrated by the fact that whereas in August 1950 B.E.A.'s cost per capacity ton-mile was 35.2d, by August of this year the figure had risen by 12 per cent. to 39.30d. Also, the wages and salaries bill has increased at the rate of £1,150,000 per annum since the beginning of the year.

In announcing its plans for the coming winter (October to March), B.E.A. mentions a planned flying total of just over 66,000 hr, an increase of 7.4 per cent on the 61,800 hr flown last winter. The Corporation is also hoping to increase by about 17 per cent its total of load ton-miles sold; this should yield an additional £650,000 in revenue.

"Flight" photograph

SOUTH AFRICAN AIRWAYS PIONEER: A characteristic photograph of the late Col. Miller, taken in 1936 with the Mew Gull which he flew in the Portsmouth-Johannesburg Race. (See "Loss to South African Aviation" in adjacent column.)



CONVAIR PLANFORM: The high aspect-ratio wing of the new Convair 340 is seen to advantage in this photograph, secured as the prototype made its first take-off on October 5th. Its wing area is considerably larger than that of its predecessor, the 240, the increase being achieved by a span addition of 13ft 11in. Turbo-prop conversion is planned.

One less publicized aspect of B.E.A.'s financial difficulties—that of having to operate a number of unprofitable "social services"—is emphasized by a recent statement by the chief executive, Mr. Peter Masefield, who points out that their friendly rivals, Air France, received in 1950 the equivalent of about £2,075,000 from the French Government as revenue in payment for guaranteed kilometres on "social services." Certainly, the application of such an arrangement in this country for flights such as those to the remoter Scottish islands (on which consistently low load-factors are the rule but which from the viewpoints of the communities served are nevertheless essential services) would relieve B.E.A. of a considerable burden.

ANTARCTIC SURVEY FLIGHT

THE Australian Minister for External Affairs, Mr. R. G. Casey, has asked Capt. P. G. Taylor to undertake a survey flight from Hobart, Tasmania, to Adelie Land, on the Antarctic mainland. Such a flight, he said, would reinforce Australia's claim to about one-third of the Antarctic continent.

Capt. Taylor will use the Catalina flying-boat *Frigate Bird the Second*, in which he made the successful 9,000-mile route survey from Australia to Chile and back last Spring; the take-off is provisionally planned for January. The trip is being made at the request of the Federal Government to investigate the possibility of relieving men stationed in the Antarctic in emergency, and also to obtain data for future aerial survey flights.

The first hop will be from Hobart to Macquarie Island, a distance of 500 miles, and the second stage entails a further 1,000 miles to Adelie Land where the French now maintain a research station.

One report states that Mr. Casey may even accompany Capt. Taylor on the flight.

A LOSS TO SOUTH AFRICAN AVIATION

THE many people in the airline industry who counted him as a friend will be grieved to hear of the death of Lt. Col. A. M. Miller, D.S.O., O.B.E., whose pioneering work was so largely responsible for the founding of both the South African Air Force and South African Airways. "Major" Miller (as he was usually known, in spite of promotion in the Second World War), who had suffered a long illness, passed away at Port Elizabeth on October 14th.

The first European to be born in Swaziland—at Schombeni on September 10th, 1892—Allister Miller transferred from the Cavalry to the R.F.C. in 1914 and three months after the outbreak of war was posted to No. 3 squadron, in which, by April 1916, he had become a flight commander.

[*Continued overleaf*

COMET INTERIOR: Although from the viewpoint of roominess and comfort the cabin layout of the Comet, as furnished for B.O.A.C., will cater adequately for even the most fastidious taste, the general "styling" of the interior follows surprisingly conventional lines for such an advanced aircraft. Further information on Comet developments appears on page 534 of this issue.

He was selected in October of the same year to undertake a recruiting and propaganda tour of South Africa, on which he covered almost 5,000 miles by air and received no fewer than 8,000 applications for the R.F.C. Of these he personally selected 2,000 of the finest recruits the R.F.C. had yet handled, for in spite of the very high standard required the South African percentage acceptance was 97.5, New Zealand being placed next with 33.3. Among his recruits, all of whom became known as "Miller's boys," were the late A. W. Beauchamp-Proctor, V.C., Maj.-Gen. C. J. Venter (the present chief airways manager of S.A.A.), Brigadier C. G. Ross, the present Director of Civil Aviation in the Union, Air Chief Marshal Sir Hugh Saunders, A. V.-M. Sir C. W. Meredith, and Capt. R. F. Caspereuthus, formerly of B.O.A.C. When the South African Air Force was formed in 1920 its members were drawn entirely from men recruited by Maj. Miller.

Soon after his demobilization he returned to South Africa with five aircraft and gave demonstrations in all parts of the Union and Rhodesias. He was elected to the Union Parliament in 1924 and in the following year, in addition to being appointed to the Civil Air Board, he was a member of the British House of Commons Delegation to the Inter-Parliament Conference at Rome, where he represented the Dominions and was responsible to the delegation in all matters affecting aviation. Later he served on the Air Ministry committee which investigated the possibility of an Empire airship service.

With the backing of Sir Alan Cobham he made another aerial tour of the Union in 1927 and two years later succeeded in forming Union Airways. The company was granted a mail contract by the Union Government and an annual subsidy of £8,000.

Union Airways operated most successfully on internal routes until 1934, when the organization and staff were taken over by the Union Government and formed into South African Airways.

In 1936 Maj. Miller flew a Percival Mew Gull in the Empire Exhibition race from England to South Africa. He again enlisted in 1939 and commanded various air training schools in the Union.

Up to the time of his illness he had been working on a history of South African civil aviation. For this purpose he had assembled a great mass of material and, it is understood, had completed the greater part of the work.

Allister Miller's generous outlook towards his fellows (writes a friend), his personality, which inspired thousands of South Africans to take to the air, his foresight and his enthusiasm—all these stamped him as one of the most outstanding aviation pioneers.

THE S.A.S. "INTRODUCTION" SERVICE

WITH the object of inducing more businessmen to fly on its transatlantic service, S.A.S. has introduced a new information service by which any American executive travelling to Europe may have the whole of his trip arranged for him in advance, including the fixing of actual appointments with the persons he wishes to contact in Europe. This novel "introduction" service, which has already begun to operate at the company's New York office, is designed to allow the traveller to make the fullest possible use of his time when he arrives at his destination. The arrangement permits contacts to be made through the S.A.S. offices in Hamburg, Bremen, Hanover, Dusseldorf, Frankfurt, Stuttgart, Nuremberg and Munich. It is soon to be extended to Scandinavian cities as well.

Although limited services of this nature have previously been offered to passengers by transatlantic operators, this is believed to be the first time that an airline has attempted to provide such large-scale encouragement for business travellers to make use of its overseas organization for personal purposes.

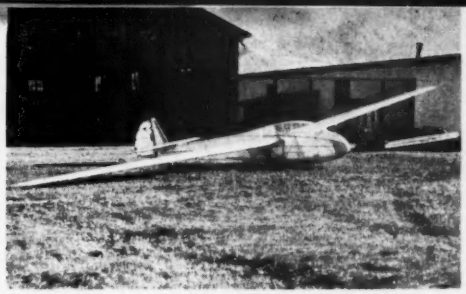
It seems unlikely that competing airlines on this route will rise to the challenge by introducing similar schemes, as most companies are of the opinion that this sort of thing is better handled through consuls, commercial attachés and chambers of commerce. S.A.S., however, believes that its new service will attract a considerably larger share of transatlantic passengers. The company has numerous European trade directories and plenty of up-to-date commercial information available at its New York office and will make special enquiries on behalf of those whose requests for information cannot be complied with at once. Another feature of the service is that portable typewriters are likely to be made available to those taking advantage of it, in order to assist them with any work they may wish to do *en route*.

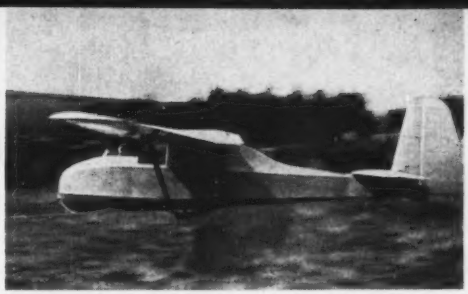
AMERICANS SEPARATE MAIL-PAY

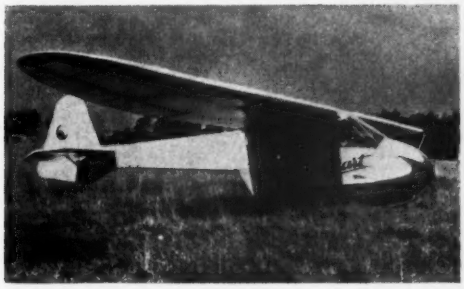
THE American Civil Aeronautics Board has decided, for administrative purposes, to identify separately mail and subsidy payments to U.S. domestic airlines. By next June the Board hopes also to extend the system to include international operators. At present the C.A.B. has no authority to pay any subsidies to airlines, but legislation now being passed through Congress would permit it to do this. During the past 13 years in which the industry has been subsidized by means of mail payments a total of $457,000,000 (about £163,214,000) has been paid out in this way to domestic airlines alone. Last year the figure was £12,142,000 in subsidies and £9,642,000 in mail pay.

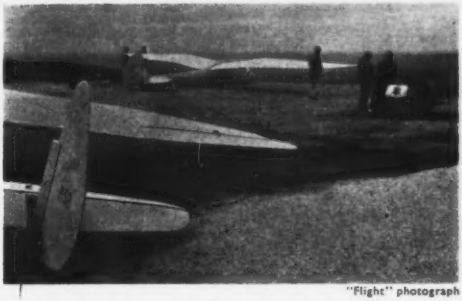
Under the Board's new system U.S. airlines are divided into seven distinct groups each of which receives a different mail-rate designed to meet its individual need. The rates vary from about 3s. 2d. per ton-mile for the "Big Four" airlines to £2 11s. 10d. for the three smallest companies. The C.A.B. has introduced this system of separating the two payments with the express intention of "providing full information as to costs of maintaining and developing the domestic airline industry."

A MINISTER A-VISITING: On arrival at Schiphol Airport during his recent visit to Holland at the invitation of the Netherlands Government, the Minister of Civil Aviation, Lord Ogmore (second from left), was greeted by the Burgomaster of Amsterdam, Mr. A. J. d'Ailly (extreme left), the Dutch Minister of Transport and Waterways, Mr. H. E. Wemmers (second from right) and the president of K.L.M., Dr. Albert Plesman (extreme right). Standing next to Lord Ogmore are Sir George Cribbett and Sir Phillip Nichols, Britain's Ambassador in Holland.









"Flight" photograph

"Flight" photograph

These pictures show something of recent activity by gliding enthusiasts in Germany and France. Competing in the first post-war gliding contest at the Wasserkuppe were several new sailplanes, (top left) the Mü-13E Bergfalke; (centre left) the Doppelraab; and (top right) the E.S.49 Baby. The panoramic view shows a glider about to be launched by the small winch at the French Centre Nationale de Vol à Voile at Montagne Noire. One of the many types used by the school is the Spalinger, of German design (centre right) seen waiting its turn at the "hairpin" type winch launch.

GLIDING on the CONTINENT

THE recent removal of the ban on gliding in Germany, the extraordinary keenness displayed by the 50,000 enthusiasts who attended the first post-war meeting at the Wasserkuppe, and the number of excellent gliders which appeared there, have all shown that Germany must soon regain the standing in the field of international gliding which she held in pre-war days.

Two constructors from Munich were particularly successful at the Wasserkuppe contests. Fritz Raab's two-seat trainer, the Doppelraab, was received with special enthusiasm. The famous German woman pilot, Hannah Reitsch, described it as "a dream of an aircraft," and after a trial flight the French gliding ace Guy Marchand also commented very favourably on its performance and handling characteristics. For thermal soaring the Doppelraab was deemed a match even for the Grunau Baby.

Another successful type which gained honours in the high-performance class was the Mü-13E Bergfalke, built by Egon Scheiber. The Bergfalke is thought by some to represent the best of contemporary developments in two-seat sailplanes and as a single-seater it has a performance equal to that of the Weihe. Both types will probably go into series production; approximate prices are estimated at 5,000 and 7,200 D. marks respectively.

Yet another new type was the Cumulus, constructed by Gerd Reinhard. This is basically the same machine as the Baby II, with the exception that the wing is carried on a central support of steel tubing which is covered by a fairing of elliptical shape. An interesting design was that of the E.S.49, a creation of Edouard Schneider —now in Australia—who achieved fame as the designer of the Grunau Baby. It is a tandem two-seater with an open cockpit copied from the R. R. G. Falken. The whole of the flat nose is of Plexiglass.

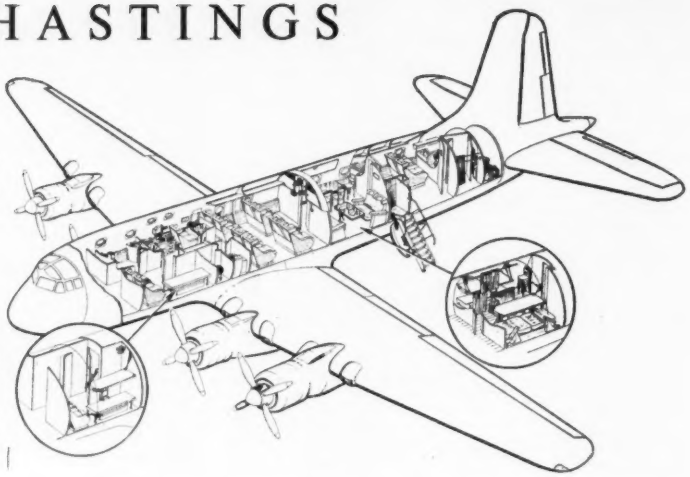
Something of a sensation was caused by the little Heuhupfer, designed by Ingenieur Lutz, of Giessen. Having a span of 6.2 m, a wing area of 8 sq/m and an empty weight of only 50 kg, this unusual machine is reported to have been built in about 900 man-hours for a total cost of £35. It has a gliding angle of 1 in 15 and a rate of sink of 1.05 m/sec.

RECENTLY *Flight* was able to visit a national gliding school, near Revel, France, known as the Centre Nationale de Vol à Voile, Montagne Noire. Half a dozen experienced instructors here teach courses of 30 to 40 students to become instructors themselves. The requirements are official sponsorship by the French government and 200 hours flying experience. In certain instances foreign—including British—pilots have also been accepted. The courses are free and take two months. There are ground lectures to suit the flying, and an excellent manual has been compiled by the chief instructor, M. Gourbeyre.

The school enjoys a beautiful hill-top location, but is not suitable for gliding during the winter months. There are some 60 gliders and sailplanes of differing types, all of French or German origin and including aerobatic single- and two-seaters. An example is the single-seat, gull-winged, Harbicht, believed to be one of only two of its kind and said to be cleared for 400 km/hr (250 m.p.h.) in the dive. Under certain circumstances paid-for gliding can be provided, and the cost mentioned for a 50-hour course works out at under 5s per hour.

V.I.P. HASTINGS

Club-room Comfort in New R.A.F. Transport



This sectioned study of the Hastings C.4 shows, aft of the cockpit, the crew's toilet, galley, crew's rest room, quartermaster's station, staff lounge and staff toilet, conference and dining room, passengers' lounge and toilet, and uniform-and-light-luggage compartments. The first detail sketch depicts the crew's rest room; the second shows the passengers' night arrangements.

FOUR special V.I.P. models of the Handley Page Hastings —designated Hastings C.4—are being acquired for Transport Command, and the first has already completed a 7,000-mile proving flight to the Near East. The type is an adaptation of the standard Hastings C.2 and is finished with a white top to the fuselage, in conformity with accepted civil practice. All passenger seats face aft.

The central cabin is equipped as a combined conference and dining room by day, or as V.I.P. sleeping quarters by night. Two folding bunks, one on each side, are stowed in the roof when not in use and two additional bunks are quickly formed by conversion of two double lounge seats and the conference table. The latter is in two parts, the smaller of which forms the table and the larger the bunk. Forward is an eight-seater cabin for the staff. Toilet facilities adjoin and included in these, as in each of the two other toilet compartments, is an electric-razor socket.

Covering the floors of the V.I.P. and staff cabins and of the conference room is dark-blue carpeting, matching the seating upholstery. The Fibreglass soundproofing is covered with light-blue leather-cloth, which is also used for bulkheads and partitions. Strip units along the roof give brilliant or dim lighting. Portholes and escape hatches have curtains and pelmets, and the toilets, the crew's rest room and galley have sliding blinds.

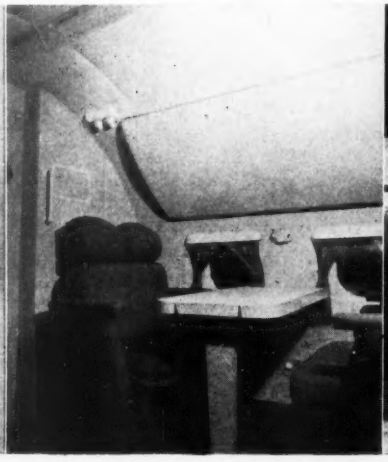
The crew's rest room is between the staff cabin and the flight deck and has two rearward-facing seats and two bunks. Adjacent, on the starboard side, is a galley, from which fumes are automatically extracted. Equipment includes an electrical refrigerator, urn, hot cupboard and grill-boiler, metal sink, dispensing counter, and cabinets for crockery and glass.

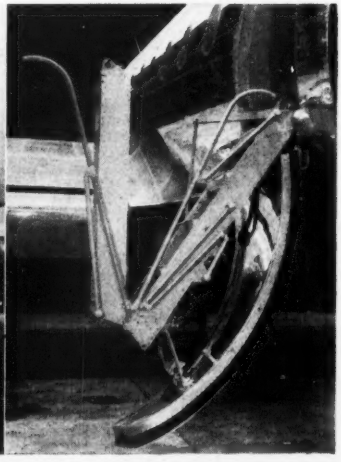
The quartermaster is stationed at the rearward end of the galley; he has a folding table, telephone, and control panel.

Other features of this luxuriously appointed aircraft are a jettisonable parachute door; hydraulically operated passenger-entry door, incorporating a folding ladder and hand-rail which extend and retract as the door opens and closes; complete air-conditioning; two oxygen systems, which normally function independently but may be interconnected; parachutes for all passengers and crew; five J-type dinghies and 18 K-type; and five escape hatches in addition to the astrodome hatch.

Notwithstanding the lavish provision for their comfort, however, the V.I.P.s may be inconvenienced from time to time by the lack of pressurization.

(Left to right) The conference table, with folding bunk above; lounge seats and dining table on the port side of the conference room; and the passenger door, hydraulically operated and incorporating folding steps and hand-rail which extend and retract as the door opens and closes.





SERVICE AVIATION

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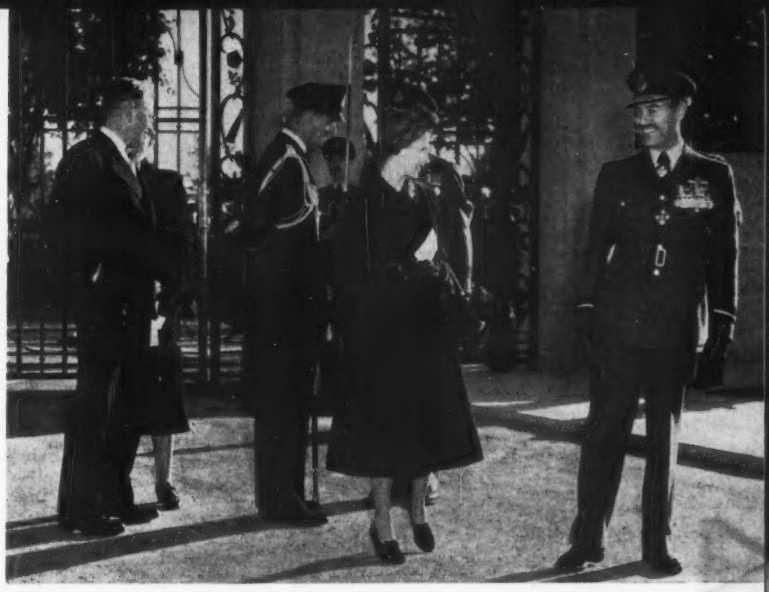

THE ROYAL TOUR: A. V-M. C. R. Slemon, A.O.C. Training Command, R.C.A.F., chats with Princess Elizabeth during her visit to the R.C.A.F. station at Trenton, Ontario. The Duke of Edinburgh is talking with the parade commander, G/C. G. P. Dunlop. On the left is the Minister of National Defence, Mr. Brooke Claxton, and Mrs. Claxton.

"Surprise Packet" and "Assess"

A HIGHLY successful air-drop of supplies and ammunition for "Midland" infantry marked the last day of the army exercise "Surprise Packet," in which the R.A.F. co-operated; the containers from the Hastings fell exactly on the D.Z.

In the three days of the exercise on which flying was possible some 600 sorties were flown and 120 attacks made on bodies of troops. In his summing-up at the close of the manœuvres General Sir Ouvry Roberts said that one of the important lessons of the exercise was the necessity for more training in avoiding being seen from the air.

The second phase of Coastal Command's exercise "Assess" opened on October 18th and was designed to practise air and naval forces in the defence of coastal convoys.

In both phases representatives of *Flight* flew in Sunderlands from Pembroke Dock. The first took part in a 12-hour patrol flown over the Western Approaches from first light until well after sunset, and writes:

There was something rather furtive about the beginning of the trip. In the dark we walked down to the jetty while the peaceable citizenry slept. We set out across sombre, lapping water to our aircraft, the position of which was proclaimed by its riding light.

At dawn we started up the outboard Pratt and Whitneys, slipped the buoy, started the inners and taxied around to run-up all engines. We were airborne, after racing across a tricky swell, in 103 sec—an exceptionally long time.

As the sun rose we climbed out over the sea and were elated by an early prospect of action. A submarine was sighted. The hooter sounded "action stations," bombs were run out under the wings and down we went to the attack. To our bitter disappointment, however, our intended victim signalled the "friendly" code-letter.

During the next ten hours or so we recorded 140 ship-sightings—mostly fishing vessels. On nine occasions we saw Ireland, and all the time we strained our eyes scanning the sea while the radar made its own search. Nothing remotely hostile presented itself, however, until last light, when we sighted an oil slick such as that left by a crash-diving submarine. Our hopes rose and we sent down a marker and a sonobuoy. But again we were out of luck.

After 12 hours, having identified yet another friendly submarine, we set course for base in brilliant moonlight, made a perfect alighting along the flarepath and taxied up to the buoy.

Twelve weary-eyed people reported to Ops. "No kills"; but they felt the satisfaction that comes of a tiring job thoroughly done. And so to bed—our place already taken by another Sunderland.

The second opportunity occurred a few days later, when we had a further opportunity to fly with a Sunderland crew from Pembroke Dock during one of the 12-hour night patrols.

The pre-flight preparations were similar to those described above, with a take-off under calm conditions at 2200 hr. Our flight plan consisted of a "cross-over" patrol (flown on a "Z" course ending with a straight return to the starting-point) at 1,000ft from Start Point lighthouse to a point just short of Jersey. Another Sunderland flying at 1,500ft covered approximately the same area on a "creeping-line-ahead" course which might best be described as that of a predetermined zig-zag pattern. Several vessels were seen but were in each case identified as friendly. Shortly afterwards, two suspect contacts were received on the radar screen but, after action stations had been called, were also identified as friendly. Just after dawn the radar equipment became troublesome and for the remainder of the patrol contacts were made visually.

R.A.F.V.R. Embarkation Unit

AMONG the first units to feel the impact of R.A.F. expansion and the arrival in this country of Allied formations are those concerned with embarkation. Recently, for example, the commanding general of he Third Air Force, U.S.A.F., sent at letter of congratulation to the Under Secretary of State for Air saying that his headquarters considered the disembarkation of 1,132 troops from the U.S.N.S. *General Stewart* in 63 minutes as an example of the complete planning and co-ordination existing between the Southampton U.S.A.F. Port Liaison Detach-

NOW WHEN I WAS YOUNG . . .: Mr. Claude Grahame-White, one of Britain's best-known pioneer pilots and constructors, exchanges reminiscences with S/L. Neville Duke at the R.A.F. Reserves Club annual dinner. On the right the C.A.S., Sir John Slessor, is seen in conversation with Air Chief Marshal Sir Guy Garrod. An account of the dinner appears on page 529.

SERVICE AVIATION . . .

ment and No. 2 R.A.F. Movements (Embarkation) Unit.

It has now been decided in this connection that three new R.A.F.V.R. units will be formed to assist the Regular R.A.F. Movements Units at the Ports of London, Southampton and Liverpool. To be known as Embarkation Flights, they will comprise six officers and forty airmen or airwomen, and they will be attached respectively to No. 86 Reserve Centre, Hornchurch, Essex; No. 23 Reserve Centre, Tichfield, Hants; and No. 42 Reserve Centre, Fazakerley, near Liverpool. For training they will go to the regular movements units in the port areas, there undertaking "on the job" work under supervision.

NAVAL CLASS-ROOM: The Percival Sea Prince T.1 "flying class-room" and communications aircraft, as now being supplied to the Royal Navy. Note the new double-wheel, long-stroke undercarriage.

Rock-climbing Tests

TWELVE picked members from the nine R.A.F. Mountain Rescue Units in the United Kingdom are on a 12-day course of rock-climbing trials in Snowdonia, North Wales, operating from a tented camp in hilly country east of Llanberis.

Severe tests are being carried out under six experienced instructors, the senior member of whom is F/O. N. Mason, officer-in-charge of the Mountain Rescue Unit and station M.O. at Edzell, Angus.

The tests are based on a directive from the chairman of the R.A.F. Mountaineering Association, W/C. A. J. M. Smyth, O.B.E., D.F.C. They deal with several aspects of rescue technique—the management of stretchers under mountainous climbs and descents, selection of suitable routes and the use of both manilla and nylon ropes. The course assembled at Valley, Anglesey, and set up their forward camp on October 15th, where they are remaining until October 27th. It is hoped to hold a mid-winter course at Kinloss, Scotland, which will possibly include ski-training and will incorporate deep winter rescue technique.

The R.A.F. Mountain Rescue Units first came into being during the last war when the first of such units was formed entirely on a voluntary basis, its object being to render quick assistance to survivors of aircraft which crashed in inaccessible parts of the country. Each of the teams in the R.A.F. consists of an officer and 36 men, all of whom are volunteers. A senior N.C.O., a wireless operator, and two drivers and an airman responsible for the maintenance of equipment, give their full time to rescue-unit duties; the remainder are all employed on routine station duties unless required in an emergency. They undertake, however, to stand-by and carry out rescue exercises in off-duty hours.

Apart from the assistance the teams have given to survivors of crashed aircraft—civilian and military—they have often gone to the aid of hikers and mountaineers in distress. Recently, during flights of the royal family from Balmoral, two teams elected to stand-by along the route as a precautionary measure.

The teams in the United Kingdom are based at the following R.A.F. stations: Valley (Anglesey), Kinloss (Morayshire), Edzell (Angus), Jurby (Isle of Man), Aldergrove (Northern Ireland), Harpur Hill (Derbyshire), Great Orton (Cumberland), Topcliffe (Yorkshire) and St. Athan (Glamorgan).

R.A.F. Chapel

IT is thought that negotiations—which have been going on for some while—to make the famous St. Clement Danes church into a central chapel for the R.A.F. will shortly be successfully completed.

Situated in the Strand, London, with lines of traffic flowing on both sides, this famous "nursery-rhyme" church is but a shell. The roof and interior were destroyed by bombing during the war. It was designed by Wren and named St. Clement Danes because it stands on the site of a church built by the Danes on an area set aside for them by Alfred the Great. St. Clement is the patron saint of mariners.

Reunions

THE first reunion dinner of No. 77 Squadron (all ranks) will be held in London on February 2nd, 1952. Details from either F/O. May, 34, Berkeley Waye, Heston, Middlesex, or W/O. Frazer, 22, Hayne Road, Beckenham, Kent.

No. 125 Squadron and 6125 Echelon intend holding their reunion on Saturday, November 17th. J. Horsley, 57, Thurleston Avenue, Morden, is the organizer.

M.R.E.S. officers will gather in London on December 8th, for their third reunion. S/L. P. E. Loughton-Bramley, M.B.E., 24, Hans Road, Knightsbridge, N.W.3, has all the details.

HANDINGS OVER: Left, Lord Trenchard congratulates S/L. S. C. Ladyman when presenting the Laurence Minot trophy to No. 7 Squadron. Right, Air Marshal Sir Robert M. Foster arrives to to take over 2nd T.A.F. from A.V-M. Sir Harry Broadhurst.

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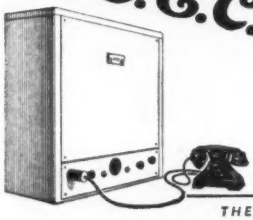

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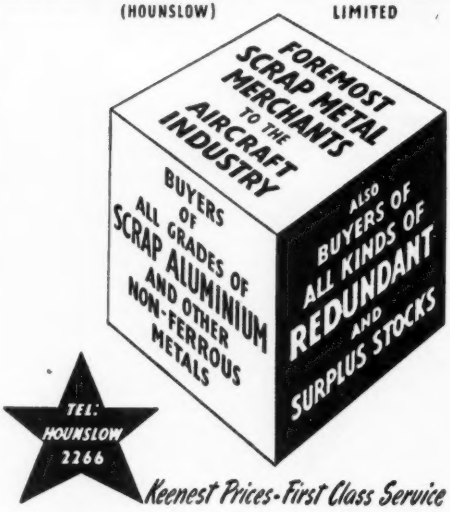
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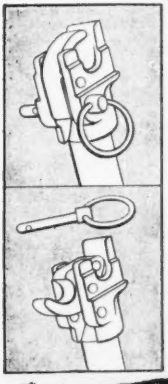

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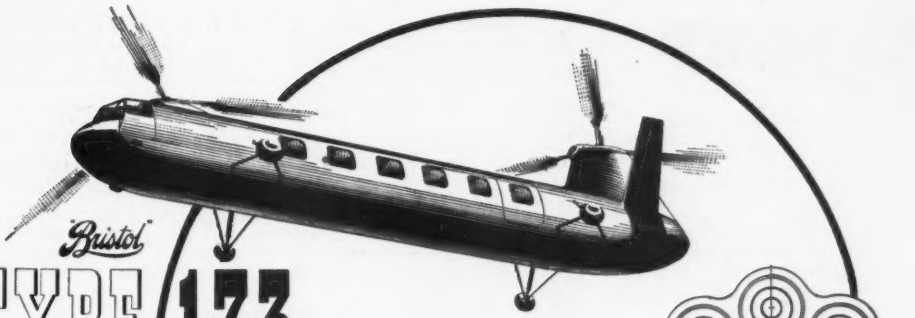

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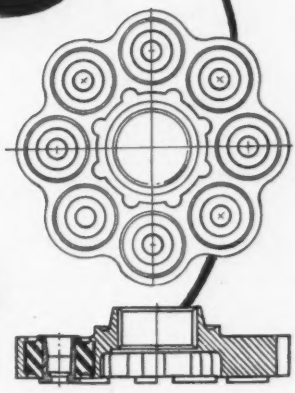

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TAKE pleasure in offering the following aircraft for immediate delivery:—
AUSTERS, PROCTORS, ANSONS, RAPIDES, DOVES also
WE offer the IDEAL private aircraft—

ONE Fairchild ARGUS

OUR competitive price—£400.

FOR spares, conversions, repairs, overhaul of aircraft, engines and equipment, contact—
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AS we go to press we recall with pride that we have over 30 aircraft already on board ship, or being prepared for shipment. They include several types: Oxford, Rapide, Auster V., Autocrat, Aiglet, Tiger Moth, Fairchild Argus, Proctor, Gemini, Messenger, Hornet Moth, etc. Not bad, is it, in these troubled times?
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£1850 SPITFIRE V.b. Rolls Merlin 55 engine. Year's C. of A. By the manufacturers. This actual aeroplane flown by our test pilot, Miss R. M. Sharpe, M.B.E., holds the British Women's Speed Record, and the World's Open 100-kilometere in Class fd. Believed to be the only single seater Spitfire in the world with civil registration markings. An ideal mount for a racing pilot or connoisseur aviator.

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IT has just over 900 hours on the airframe and a little more than 100 hours on the engine since new. It is tastefully finished in cream and red with maroon upholstery by Rumbold. It is equipped with dual control and is offered with 12 months C. of A., delivery 2/3 weeks and the price is £695.

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WHI. 2948. Cables: Dundasaero, Piccy, London.

CROYDON Airport: CRO 0408. [0559

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AIR ENTERPRISES, Ltd., Croydon Airport, have for disposal one 8-seater DH 89 fitted with long-range tanks and radio.—Full details and price will be given on application or exchange for Airspeed Consul be considered. [7124

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REPAIRS and C. of A. overhaul for all types of aircraft. Brooklands Aviation, Ltd., Civil Repair Service, Sywell Aerodrome, Northampton. Tel.: Moulton 3281. [0307

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AUSTER (Lycoming) preferred, Stinson and similar light plane with C/A wanted.—Box 4752. [7126

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W. S. SHACKLETON, Ltd., Europe's biggest aeroplane dealers (20 years at this address and 119 different types of aircraft sold) have at the moment of writing over thirty aeroplanes on board ship or awaiting despatch to foreign parts. We wish to buy a few good sound Autocrats, Messengers, Consuls, Geminis and Tiger Moths. Also D.H. Doves, Dakotas and D.C. 4's If we can get them!
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NO need to resign yourself to remain for ever on the endless housing queue. Here, at Ferraris of London, is your very own home that you have been longing for. It is comfortable to live in, has beautiful modern built-in furniture, and the kitchen is the delight of every house-wife.—Send today for a free copy of our illustrated brochure to:

F.O.C. CARAVAN CENTRE, 200-220, Cricklewood Broadway, Edgware Road, London, N.W.2. Tel.: GLAdstone 2234. Open daily 8.30-6 p.m. Sunday 11-4 p.m. [0207

NEW "Statesman," £1,085. Other Berkeleys from £599/10/-. New Glider 4-berth de luxe, £399/10/-, and 2-berth, £212. Safari, £368. Towing. Hire purchase.—Mantles Garages, Ltd., Biggleswade. Tel. 2113. [0367

GREAT clearance sale of new 1951 models! Specimen bargains: Raven Castle, 4 berth, £70 reduction; Chatfont, 4-berth, £60 reduction, etc. See also special display of 35 leading new models from £210 to £850. Buy now. Caravans will shortly be scarce and dear. Liberal H.P. Assistance with sites, anywhere.—Stafford and Co., Caravan Specialists, Bus Terminus, Kirkheaton, Huddersfield. Phones, 4004 and 3067. Always open. Members C.D.A.A. "Buy where you are safe." [7111

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R.A.F. and R.N. officers' uniforms purchased; large selection of R.A.F. officers' kit for sale, new and reconditioned.—Fisher's Service Outfitters, 86-88, Wellington St., Woolwich. Tel. Woolwich 1055. [0567

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HERTS AND ESSEX AERO CLUB, Broxbourne Aerodrome, Nazeing, Essex. M.A.C. approved 30-hour course; sole flying from 30/- per hour; residential; trial lessons 25/-; train from Liverpool St., or Green Line Coach 715.—Tel.: Hoddesdon 2453, 2421, 3705. [0230

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FIRE protection by modern methods. Write for booklet F.S.F.A.E. to National Fire Protection Co., Ltd., Essex Works, Faggs Rd., Feltham, Middx. Tel.: Fel. 4081. [0580

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ROYAL OAK HOTEL, Keswick-on-Derwentwater, heart of English Lake District, offers restful holiday to Air Force personnel; first-class accommodation at reasonable charges. [0414

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ALL types of aircraft insurance and personal accident cover.—Apply to J. W. T. Amey, Messrs. R. J. Moffat and Co., Percy House, 796, High Rd., Tottenham, N.17. Tel.: Tottenham 2003-4-5. [0584

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STAFF item checking and job-casting time recorders (all makes) for quick cash sale; exceptional condition. —Box 7241. [0040

TIME recorders service rental. Tel.: Hop. 2239. Time Recorder Supply and Maintenance Co., Ltd., 157-159, Borough High Street, S.E.1. [6413

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DUAL and solo Austers, M.C.A. approved. Weekdays, 45/6; week-ends, 51/6. Tel.: Elstree 3070. [0702

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TEL.: Rochford 56204. Comprehensive flying training. Private and commercial licences from £3 per hour, on contract from £2 per hour, on Auster aircraft. No entrance fee, no subscription. Write for full particulars. [0332

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A.F.R.Ae.S., A.R.B.Certs., A.M.I.Mech.E., etc., on "no pass, no fee" terms; over 95 successes. For details of exams. and courses in all branches of aeronautical work, navigation, mechanical eng., etc., write for 144-page handbook free. B.I.E.T. (Dept. 702), 17, Stratford Place, London, W.1. [0707

A Connoisseur's Machine

Auster Autocrat "Aerop ane" *Photograph*

Rarely before has such a magnificent used Autocrat found its way on the market, and this only comes about because the owner is buying a larger machine from us. Neither airframe nor engine have more than 200 hours since new and the Certificate of Airworthiness is valid until March next year. Special characteristics include screened ignition harness facilitating easy installation of radio, Directional Gyro, Metal Propeller and Silencer. The whole thing is in immaculate condition, being finished in cream with blue upholstery and internal fittings. **Price £700.** Fly-away Gatwick.

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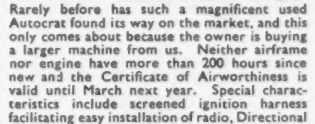

Miles Gemini

. . . AND AT A KNOCK-OUT FIGURE, TOO

This Gemini was manufactured in 1946, since when its engines have flown 573 hours and the airframe slightly less, the engines being cleared for 1,000-hour life and having sand-cast heads. Full blind-flying panel and screened ignition are incorporated, and, though the Certificate of Airworthiness expired in June, renewal should not be expensive, as the aircraft has flown only 11 hours since previous overhaul.

Price £1,150. Ex Gatwick.

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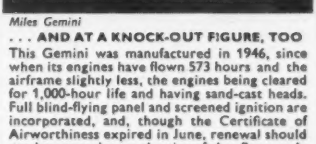
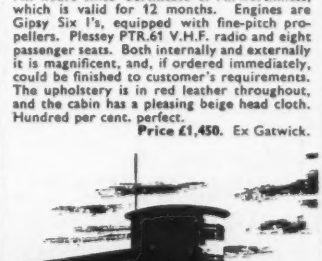


D.H. 89a "Flight" *Photograph*

THIS RAPIDE IS JUST THE THING

Nil hours since Certificate of Airworthiness, which is valid for 12 months. Engines are Gipsy Six I's, equipped with fine-pitch propellers. Plessey PTR.61 V.H.F. radio and eight passenger seats. Both internally and externally it is magnificent, and, if ordered immediately, could be finished to customer's requirements. The upholstery is in red leather throughout, and the cabin has a pleasing beige head cloth. Hundred per cent. perfect.

Price £1,450. Ex Gatwick.



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SCHOOL OF NAVIGATION, University College, Warsash, Southampton. Flight navigator's course £16/10/- for six months' tuition; pilot licences, £7/10/- to £13/10/- for six months' tuition; Link instruction; all approach systems, 10/- per hour or £3/10/- for ten hours; postal courses; hall of residence. Tel.: Locks Heath 2161. [0557

COLLEGE OF AERONAUTICAL & AUTOMOBILE ENGINEERING, Chelsea and Redhill Aerodrome. Diploma courses in aeronautical engineering combine full day workshop and technical training with coaching for R.Ae.S. Associate Fellowship examination. Parts 1 and 2: aircraft engineers' licences, etc., in preparation for executive positions. Syllabus from the College Secretary, Sydney Street, Chelsea, S.W.3. Tel.: Flaxman 0021. [0019

SITUATIONS VACANT

THE DE HAVILLAND AIRCRAFT CO., LTD. HAVE VACANCIES FOR SENIOR DESIGN AND INTERMEDIATE DRAUGHTSMEN

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HIS MAJESTY'S COLONIAL SERVICE, NIGERIA.

GRADUATES in PHYSICS or MATHEMATICS with 1st or 2nd class honours are invited to apply for posts as meteorologists in Nigeria. Professional experience desirable, but successful candidates with no previous experience will be given a course of training. The posts are permanent and pensionable after a period of probation, with salary in the scale £660-£1,300 plus a temporary non-pensionable allowance. Minimum commencing salary £711, higher according to experience. Tour of service 18 months with free 1st class return passages for officer, wife and 2 children under 16. Low income tax. Candidates should apply to the Director of Recruitment (Colonial Service), Colonial Office, Sanctuary Buildings, Great Smith Street, S.W.1, giving brief details of age, qualifications and experience, quoting the reference number 27118/4/51. [7120

HANDLEY PAGE, Ltd., have vacancies for:

AERODYNAMICISTS with 1st or 2nd class Hons. degree and preferably with a minimum of three years' experience.

WIND tunnel technicians with 1st or 2nd class Hons. degree and with experience in or preference for wind tunnel work.

JUNIOR stressmen of degree standard. Experience preferred but not essential.

SENIOR design and intermediate draughtsmen, preferably with aircraft experience, for their Cricklewood and Radlett offices. Consideration will be given to applicants with experience in light structural or mechanical engineering in possession of O.N.C. or H.N.C. (mech. or elect.) as advantageous.

LOFTSMEN with previous experience in full-scale layout work or similar workshop practice. These vacancies are at Cricklewood only.

APPLICATIONS, stating age, qualifications and details of experience, to: Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [0739

CANADIAN company urgently requires for operations in Canada:

1. Experienced aero-engineers; (2) experienced helicopter engineers; (3) experienced helicopter pilots.

SALARY range from $2,500 to $6,000 per annum, according to qualifications.—Write, giving details and references, to Spartan Air Services, 348, Queen Street, Ottawa, Canada. [7096

WESTLAND AIRCRAFT Ltd. have vacancies for the following:—

STRESSMEN, intermediate and senior.

DRAUGHTSMEN, intermediate and senior.

SPARES COMPILERS.

APPLY, stating age, qualifications, experience and salary required, to Personnel Officer, Westland Aircraft Ltd., Yeovil, Somerset. [7078

APPLICATIONS are invited for the following positions in the London area:

PLANNING engineers and tool designers. Applicants must have experience on aero materials and modern machine shop practice.

ALSO senior methods engineers, electrical and/or mechanical, with experience on development work in production shops. The positions are supernannuated and offer considerable scope to men with adequate experience. Write, giving full details in strictest confidence, to the Employment Officer, Rotax, Ltd., Chandos Road, Willesden Junction, N.W.10. [7137

APPLICATIONS are invited for the following positions in the London area:

DRAUGHTSMEN required for detail drawing or experimental designs of aircraft electrical equipment. Works experience essential.

WRITE, giving full details in strictest confidence to the Employment Officer, Rotax, Ltd., Chandos Road, Willesden Junction, N.W.10. [7069

PILOT, licensed, based Beirut, excellent prospects.—Dixon, 49 Queens Court, Richmond 5728. [7115

WANTED, flight engineers for York aircraft. "A" and "C" to cover York aircraft essential.—Apply: Chief Engineer, Eagle Aviation, Ltd., Luton Airport, Luton, Beds. [0610

AIR ENTERPRISES, Ltd., Renfrew Airport, Scotland. A vacancy for an engineer holding "A" and "C" licences.—Applications should be addressed to Head Office, Croydon Airport, Surrey. [7123

APPLICATIONS are invited from design draughtsmen and stressmen; also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero engines.

APPLICATIONS should state full particulars of experience and qualifications and should be addressed to The Personnel Manager, The de Havilland Engine Co., Ltd., Stonegrove, Edgware, Middx. [0567

SITUATIONS VACANT

APPLICATIONS are invited for the following positions in a new team which is being set up for the development of guided missiles.
(1) DRAUGHTSMEN
(a) To take charge of the drawing office.
(b) To specialise in propulsion.
(c) To specialise in instruments.
(d) To specialise in electrics and electronics.
(e) To specialise in structures and controls.
(2) TECHNICAL ASSISTANTS
(a) To work on the prediction and analysis of flight trials.
(b) To work on stress analysis.
(3) ENGINEER to take charge of the trials team.
Applications are also invited for the following to work on aircraft design
(1) Structural engineers and stress analysts.
(2) Aerodynamicists.
Write, stating age and experience, to The Personnel Manager, Short Brothers and Harland, Ltd., Queen's Island, Belfast. [7114

LICENSED aircraft radio engineer required immediately.—Apply to Chief Engineer, Eagle Aviation, Luton Airport, Beds. [0811

WEIGHTS engineer required. Varied, interesting work.—Portsmouth Aviation Developments, The Airport, Portsmouth. [7009

TECHNICAL GRADES required for Ministry of Supply Establishment at Farnborough, Hants. Candidates must be British of British parentage with recognised engineering apprenticeship.

POST ONE. Supervision of an armament development section dealing with documentation involved in linking design with manufacture in quantity; production of equipment schedules, technical pamphlets and development instructions; liaison with contractors. Candidates must possess wide knowledge of armament stores including bombs, pyrotechnics and associated equipment.

POST TWO. Supervision of the operation of ranges (ground, aircraft and fragmentation firing), machine and repair workshops and facilities; maintenance of range installation; control of local ammunition storage; day-to-day range safety control; manufacture of experimental mountings and targets gun and feed adaptations. Candidates must have had practical experience of the maintenance, storage and handling of modern aircraft armament including installations, rearming of aircraft and storage of explosives; gun firing trials and general range duties. Possession of Ordinary National Certificate is desirable. Attendance at an approved Air Armament course or experience of instrumentation and the operation of aircraft armament during flight would be an advantage. Salary £625 (at age 30)—£785 p.a. Unestablished, career opportunities for establishment may arise. Written applications giving date of birth and education, full details of qualifications and experience of posts held (including dates) should be addressed to Appointments Officer, Ministry of Labour and National Service, 1-6, Tavistock Square, W.C.1, quoting reference number KE 927, within 10 days of appearance of this advertisement. In no circumstances should original testimonials be forwarded. Only candidates selected for interview will be advised. [7118

DESIGNERS and senior and junior draughtsmen for work on gas turbine engines. Midland area. Experience not essential but an advantage.—Apply to Armstrong Siddeley Motors, Coventry. [0616

CHIEF jig and tool designer with experience in production development engineering for complete aircraft.—Apply in first instance with particulars of qualifications, experience, age, and salary required, to Box 4094. [7132

ESTIMATORS and ratefixers required, accustomed to aircraft work, for the South West area.—Write, giving full particulars, to Box J3619, A.K. Advertising, 212a Shaftesbury Avenue, London, W.C.2. [7107

NORMALAIR, Ltd., Yeovil, invite applications from the following, for work in connection with aircraft air conditioning, pressurizing and high altitude breathing equipments:—

DESIGNERS.

DRAUGHTSMEN.

TECHNICAL ASSISTANTS.

TECHNICAL CLERKS.

STRESSMEN.

TECHNICAL ILLUSTRATORS.

APPLICATIONS to the Personnel Officer, Normalair, Ltd., Yeovil, Somerset, must state age, experience, qualifications and salary required. Where convenient selected applicants will be interviewed in towns near their address. [7030

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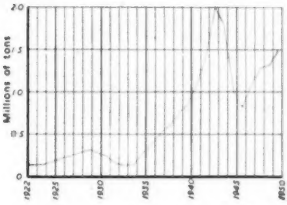
About Aluminium . . . 10

CONCLUSION

Growth of the Industry

During the half century of aluminium's commercial life, the producing industry has expanded enormously. Demand has fluctuated, but has seldom fallen below supply. The needs of war have greatly accelerated the expansion of smelting and fabricating plants, but, after military consumption fell off, the new production capacity was quickly absorbed by an increased industrial demand. This spasmodic but almost continuous growth is illustrated by the graph of world ingot production, below.

World production of aluminium is probably still below the 1943 peak (owing to the decreased capacity of certain nations), but in countries for which figures are available the whole output could at present be absorbed by the growing demands of their civilian industries, and there is, for the time being, a world shortage.



World Aluminium Production

Thus aluminium has in a few years grown to become one of the major industrial metals, and its production is, in volume, exceeded only by that of steel.

Reasons for growth

We have said that the greatest expansion of the industry has taken place in wartime, to furnish the material of military aviation. Considering aluminium as a general engineering material, however, it is interesting to account for its rapid headway.

Firstly, this progress has been made on intrinsic technical merits, by virtue of the rather extraordinary combination of properties possessed by the element and its alloys, as recounted in earlier articles. Aircraft construction is only one of the fields in which aluminium is pre-eminent, and not, in time of peace, a major one in terms of output.

Apart from the natural provinces of aluminium, there are countless tasks that the light metal can perform as well as, and often rather better than, traditional materials. For these duties, the adoption of aluminium would normally be slow, owing to a natural reluctance to change production methods to suit a new material unless it offers sweeping technical advantages. During and after a war, however, shortages of familiar materials are apt to occur, and because of such shortages aluminium has recently entered many new spheres. Sometimes, lacking one or more of the desirable qualities of the original, it continues to be regarded as a substitute; more often an improvement is recognized, and aluminium is permanently adopted.

Although price is less important in time of shortage, present price trends, shown in the second graph, are of the greatest significance to the future of aluminium. From being one of the dearest commercial non-ferrous metals, aluminium has become one of the cheapest by weight, easily the cheapest by volume. Its falling cost in relation to these metals and to steel is now opening up markets that were hitherto economically unapproachable.

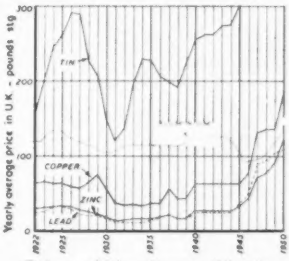
A relatively falling price is to be expected of a comparatively new material such as aluminium, and is attributable to such things as improvements in extraction and fabrication techniques, a recent example being the semi-continuous rolling of sheet. The steady development of qualities to meet special conditions of use has resulted in the present wide range of alloys, and these and other technological advances have done much to expand the market.

The Future

Aluminium has already challenged established materials in almost every industry, and it seems that, on both technical and economic grounds, this challenge will continue on an increasing scale. Though its present position is strong, its industrial importance will, as it becomes more plentiful and cheaper, undoubtedly grow.

Examples of the potential markets that have scarcely begun to use aluminium are to be found in shipbuilding and in the mass-production of motor-cars, where the light metal is technically very attractive. The principal obstacle is first cost, but with further convergence of the prices of aluminium and steel, and growing appreciation by users of the economies (in performance, maintenance, and disposal value) resulting from the use of light alloys, more and more aluminium will be demanded by industries such as these.

The scope of aluminium is from time to time extended by the introduction of new methods in manufacture. Recent developments that may well have considerable future importance include the argon-arc welding process, assembly by high-strength adhesives (already practised by aircraft manufacturers), the development of a satisfactory soldering technique, the introduction of cold welding by pressure, and the practicability of plating aluminium with hard chromium to improve its wearing and frictional properties in machine parts. Desirable improvements in the alloys are likely to enhance such properties as ductility, fatigue- and corrosion-resistance, and not merely to raise tensile strength. This is indicated by the fact that demand is at present greatest for alloys of only moderate tensile strength that possess other appropriate qualities.



Prices of Non-ferrous Metals

The western world's capacity for producing primary aluminium is to be substantially increased in the near future. This continual expansion raises the question of the supply of bauxite, the rich ore essential to the present smelting process. Known reserves are very large, but when these have been exhausted, less rich ores abound everywhere in the earth's crust, of which they form about one-third, so there is no fear of the supply of raw material coming to an end in the foreseeable future.

As the uses of aluminium extend, there is a growing demand for information about it, and this is our justification for publishing these articles (now offered in book form). We would also remind you that information on specific problems is always freely available.

In this series we have summarized, for the interest of students and others, some of the main characteristics of the metal and its alloys. The articles have now been reprinted in book form, and we shall be pleased to send you a copy.

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